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In This Issue—Indianapolis Race Entries

# MOTOR AGE

Volume XXXVII  
Number 22

PUBLISHED WEEKLY AT THE MALLERS BUILDING  
CHICAGO, MAY 27, 1920

Thirty-five Cents a Copy  
Three Dollars a Year

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ditions were encouraging factors in  
stopping the rise of the water which  
is now four feet above flood stage.

that an agreement had been reached  
Turn to No 1. First Col. Page 2

## HUGE SWINDLE IN SPARK PLUGS IS UNEARTHED

One Man Held in Chicago;  
Others to Be Arrested.

MILLION WAS CLEARED

Imitation of Toledo Concern's  
Product Marketed.

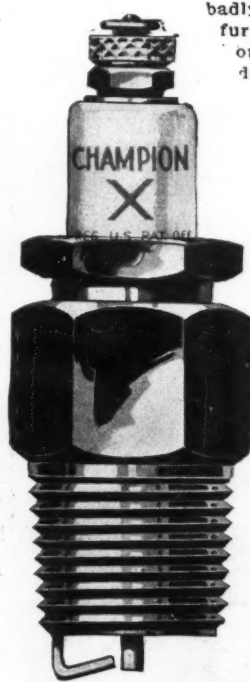
(ASSOCIATED PRESS DISPATCH)

CHICAGO, February 20—One man

to Captain of Detectives Emmet  
Carl, after but a few minutes  
question-

was under arrest here to-day and  
a number of others were sought in  
connection with what police said  
was a plot to flood the market with  
low-grade spark plugs bearing the  
trade mark and name of a Toledo  
O., company. The imitations, ac-  
cording to the police and company  
representatives, have been made in  
Chicago and disposed of by thousands  
for four years. The alleged swindle  
is said to have netted more than  
\$1,000,000 and to have threatened  
the existence of the original com-  
pany. So nearly perfect in appear-  
ance is the imitation that it deceived  
scores of dealers handling the gen-  
uine spark plug, the police said  
and many dealers innocently re-  
placed spurious plugs after they  
quickly wore out. Other dealers  
were charged with "profiteering"  
when they asked the standard price  
for the genuine plug after the imita-  
tion had been purchased elsewhere  
at a lower figure.

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## For Your Protection

THE clipping reproduced above has appeared generally in the newspapers thruout the country. It refers to a plot entered into by certain unscrupulous persons in an effort to defraud dealers into buying a low-grade imitation of much inferior quality to our famous Champion "X" Spark Plug.

While prosecution and conviction has already resulted in some cases, we expect to obtain the same results in other actions now pending both for the protection of the consumer, dealer, jobber and ourselves and we will not stop till we have cleared the country of these fraudulent imitations.

While the figures mentioned in the press dispatch are exaggerated, they serve the purpose of warning dealers to handle only genuine trade-marked goods.

All genuine Champion "X" Spark Plugs are packed in cartons—25 cartons per case to the dealer. Each carton as well as each plug must bear our trade-marked name "Champion."

- For your protection
- Avoid Champion Spark Plugs offered at less than regular prices and not in original packages.
- Buy Champion Spark Plugs thru regular jobbing sources.

**Champion Spark Plug Company, Toledo, Ohio**

Champion Spark Plug Company, of Canada, Limited, Windsor, Ontario





# JOHNSON'S RADIATOR CEMENT

**T**HE easiest and quickest way to repair leaks in radiators, pumps, water jackets, motor head gaskets, hose connections, etc., is with Johnson's Radiator Cement. It will stop leaks in from two to ten minutes without laying up the car. It requires no experience to use Johnson's Radiator Cement—all you have to do is to remove the radiator cap and pour the Radiator Cement into the radiator.

## *Quick—Efficient—Harmless*

Johnson's Radiator Cement will not coat or clog the cooling system. It blends perfectly with the water until it reaches the leaks. As it comes in contact with the air it forms a hard, tough, resisting substance which is insoluble in water and stops the leak. A half-pint is sufficient for a Ford.

## *Keep Your Car Young with Johnson's Car Savers*

Start today to reduce the depreciation of your automobile. An hour or two every month and JOHNSON'S CAR SAVERS will prove their value in dollars and cents when you come to sell or turn in your car. There's a JOHNSON CAR SAVER for every purpose.

Johnson's Carbon Remover—prevents 80% of engine trouble.

Johnson's Stop-Squeak Oil—a wonderful spring lubricant.

Johnson's Valve Grinding Compound—gives a velvet seat.

Johnson's Cleaner and Prepared Wax—make body, hood and fenders look like new.

Johnson's Black-Lac—the perfect top dressing.

Johnson's Auto-Lak—a splendid one coat body varnish.

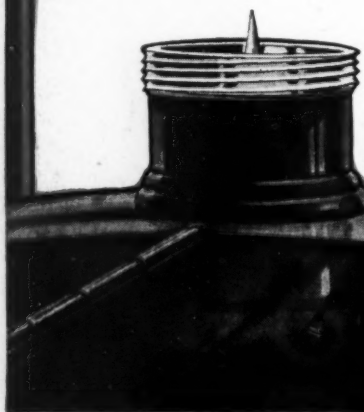
Johnson's Hastee Patch—can be applied in two minutes.

Johnson's Radiator Cement—Liquid.

*Sold by Dealers and Garages Everywhere*

Write for our folder "Keep Your Car Young"—it's free.

S. C. JOHNSON & SON  
MA 5, Racine, Wis., U. S. A.





# MOTOR AGE

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No. 22

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## "NORMA" PRECISION BALL BEARINGS

(PATENTED)

The trouble-proof car, or truck, or tractor, or power boat, has yet to be placed upon the market. But each passing year carries automotive construction closer to this ideal. And—under the same impulse toward betterment of practice and improvement of service—each year brings an increasing demand for these proved, dependable, high-grade magnetos and lighting generators in which "NORMA" Bearings are standard.

See that your electrical apparatus is "NORMA" equipped.

## THE NORMA COMPANY OF AMERICA

Anable Avenue  
Long Island City  
New York



Ball, Roller, Thrust and Combination Bearings


## Special "Points"

Not only the special alloy firing points make Hercules Giant plugs good—but considerable sales points.

Advertising that reaches practically every car owner in the country — every one instructing the reader — "Ask Your Dealer for Hercules Plugs." Dealer Helps that form the point of contact between the national advertising and your customers.

It's your fault if these points don't point the way to increased sales. You can handle Hercules—you can use Hercules Dealer Helps. You can build a bigger spark plug business.

Write us today. Get the pointers on the Hercules Dealer's proposition.



Special Alloy  
Firing Points

PAT  
2-16-15

**HERCULES**  
**GIANT SPARK PLUGS**

Pre-ignition, intermittent firing, fused electrodes, pitted points and a thousand and one other troubles may result from the use of inferior electrode wire. HERCULES plugs are all equipped with special alloy firing points which outlast your engine. Equip complete with Hercules — avoid troubles — eliminate fouling. Write for size chart. Eclipse Manufacturing Company, Indianapolis, U. S. A.

*Ask Your Dealer for*

One of the Hercules advertisements that are reaching practically every motorist through the leading national weekly and monthly magazines and farm papers.

ECLIPSE MFG. CO. Indianapolis, U. S. A. Makers of

# HERCULES

## GIANT SPARK PLUGS



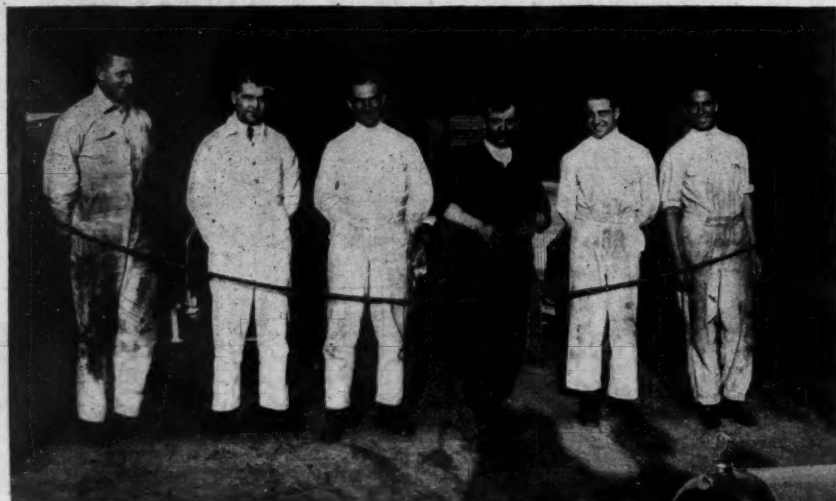
# MOTOR AGE

## CAN YOU PICK A WINNER FROM THIS?



Here are the drivers who are going to vie with one another on the Indianapolis speedway May 31. The four men at the top each have won a five hundred mile race on the Hoosier track and each stands an excellent chance of winning this year's race. In next week's issue there will be a repetition of this checkerboard arrangement of the drivers showing the winner in the upper left hand square, followed by the pictures of the drivers who finish the race. With the exception of the four drivers at the top there has been no attempt in the arranging of this checkerboard with regard to the relative abilities of the drivers. All are veterans, and given cars that will stand the grind can be counted upon to give their fellow drivers stiff competition. Watch next week's issue for the checkerboard arranged according to the race results

# New Designing Gets Test at Indianapolis



Above, Ralph de Palma and Louis Chevrolet "entertain" with an interchange of compliments; right, Barney Oldfield and the Marmon in which he will pace the field for the first lap



France and the United States in International Rivalry in the Field of Small Racing Cars

BY ROY E. BERG

INDIANAPOLIS, May 26—France and America will resume their historic rivalry for supremacy in automobile designing Monday over the Indianapolis course with greater stakes this year than ever before. To the individual who is victor in this year's contest will go at least \$20,000 in cash with the probability of his earning \$10,000 to \$15,000 more from the various "added money" awards which have been put in independent of the race purse. To the nation which furnishes the winning car will go the glory of having achieved the greatest measure of progress in a new field of automobile engineering.

For this year's race is between cars embodying a new principle of motor car engineering. In this year's cars, for the first time in any great race, weight has been absolutely sacrificed. This really is a light car race. The limitations of the cars this year—183 cu. in. piston displacement and a minimum of 1800 pounds in weight—make the cars of 1920 look like pigmies as compared with racers of former years. The Baby Peugeot—which was a real baby in 1913 and 1914—is a full grown adult in this year's race.

And this year's race is one between untried cars. A week before the race there were a scant ten cars in practice on

the Indianapolis Speedway—the rest of the thirty-two entries either were in the process of completion or were in shipment. Not a car which starts Monday will have more than 400 or 500 miles of actual travel under its hood. Most of them will have had only enough work to tune them up to their fullest possibilities, and to show that they are capable of running at a speed sufficient to qualify.

But with all this sacrifice of speed, the rival designers have been forced to build substantially as well as lightly. A great French engineer has declared that there is no finer test of automobile stability in the world than a 500-mile Indianapolis race. The racking, grinding speed over a track which is far from smooth can be counted upon to bring out any weakness which is inherent in a car's construction and design. So any car which finishes in this year's grind may be counted as worthy and stable, whether it finishes first or tenth.

Only two nations—France and the United States—are represented in the 1920 carnival, but a third, Italy, is represented at least in designing ability. France enters two great teams, the Ballot and the Peugeot. America has three teams, Moore, Frontenac and Duesenberg—although two of these, Fron-

## The Entries for the 500-Mile Race

Car	Driver	Cylinders	Bore	Stroke	Piston displ.
Chevrolet	R. E. Durant	8	2.56	4.41	181
Ballot	Ralph DePalma	8	3.125	5.9375	182.5
Monroe	Louis Chevrolet	4	3.125	5.9375	182.5
Monroe	Gaston Chevrolet	4	3.125	5.9375	182.5
Monroe	Roscoe Sarles	4	3.125	5.9375	182.5
Frontenac	Joe Boyer	4	3.125	5.9375	182.5
Frontenac	A. Chevrolet	4	3.125	5.9375	182.5
Frontenac	Art Klein	4	3.125	5.9375	182.5
Peugeot	Ray Howard	4	3.07	6.15	181.8
Duesenberg	Thomas Milton	8	2.5	4.625	181.5
Duesenberg	Jimmy Murphy	8	2.5	4.625	181.5
Oldfield	Waldo Stein	4	—	—	182
Revere	Tom Rooney	8	2.5	4.625	181.5
Peugeot	Jules Ellingboe	4	3.15	5.83	181.7
Peugeot	Andre Boillot	4	3.15	5.83	181.7
Peugeot	Howard Wilcox	4	3.15	5.83	181.7
Gregoire	Jean Porporato	4	3.07	6.15	181.8
Gregoire	Jack Scales	4	3.07	6.15	181.8
Philbrin	Ira Vail	8	2.5	4.625	181.5
Ellingboe	Jules Ellingboe	—	—	—	—
Ellingboe	C. Glenn Howard	—	—	—	—
Ballot	Rene Thomas	8	2.56	4.41	181
Ballot	Jean Chassaingne	8	2.56	4.41	181
Kenworthy	Kurt Hitke	8	2.5	4.625	181.5
Monroe	Joe Thomas	4	3.125	5.9375	182.5
Duesenberg	Eddie O'Donnell	8	2.5	4.625	181.5
Duesenberg	Eddie Hearne	8	2.5	4.625	181.5
Richards	John R. Boling	—	—	—	—
Mulford	Ralph K. Mulford	8	2.5	4.625	181.5
Meteor	Willie Haupt	8	2.5	4.625	181.5
T. N. T.	Frank Elliott	4	3.375	5	180
Revere	Not named	8	2.5	4.625	181.5



tenac and Monroe, are identical in design. But America has several individual entries aside from its teams, so the United States may be held to have a considerably greater preponderance of design entries than its chief rival.

#### Gregoire's French-Italian Combination

Italy is represented only in part, for the Gregoire cars are ostensibly of French design and originally were designed by French engineers, only to be redesigned and changed by Porporato, an Italian. England disappointed by failing to give her entry on account of the inability of the English engineers of the Sunbeam to get their cars ready; Italy lost a chance for full representation because of similar inability on the part of Fiat engineers; Germany is not represented because German engineers were given to understand that their presence was not desired, this year at least.

The very appearance of the cars this year bears out the improvements which have been made in automobile design and building. Instead of huge engines depending upon the brute force of terrific power for their speed, we have this year small, lightly designed machinery of almost superhuman cunningness of operation. Quantity in excess has been replaced with quantity reduced to a minimum. Quality is the dominating factor in this year's cars; quality in materials; quality in workmanship; quality in design.

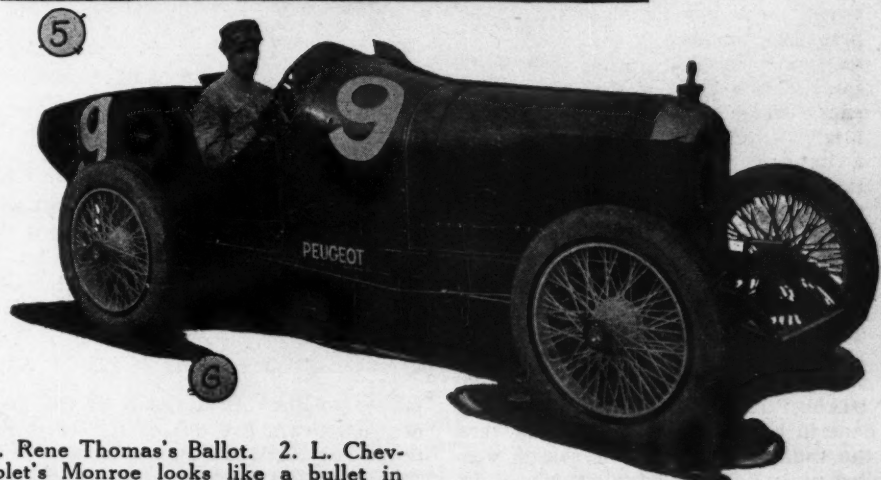
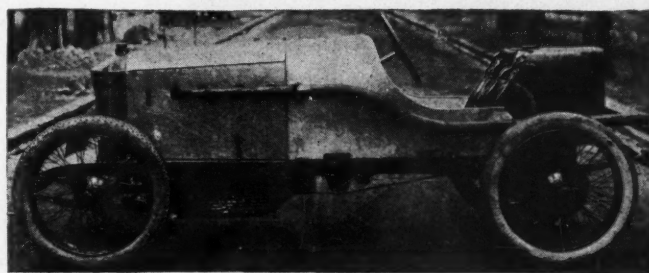
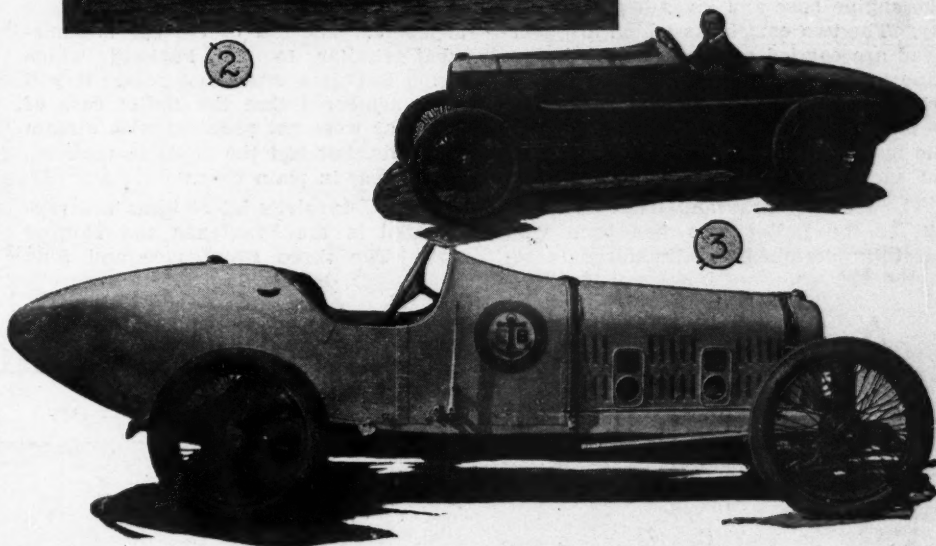
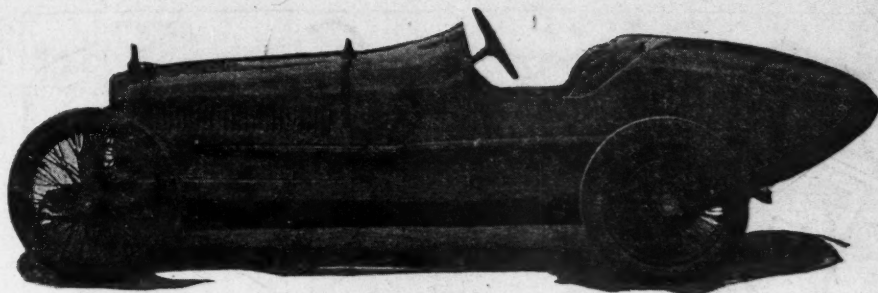
#### Designer's Work Is Apparent

One cannot but see the hand of the designer in the cars. It is a touch here and a touch there; the streamlining of the front axles; the tie rods; the more nearly perfect contour of the bodies; the perfection of the lubricating system; the chassis oiling. All denote the progress toward the one ideal—perfect transformation of gasoline energy into forward motion. The fact that few cars had put in an appearance on the track less than a week before the race is not alarming when one considers the obstacles which have been overcome in the construction of those cars since last year.

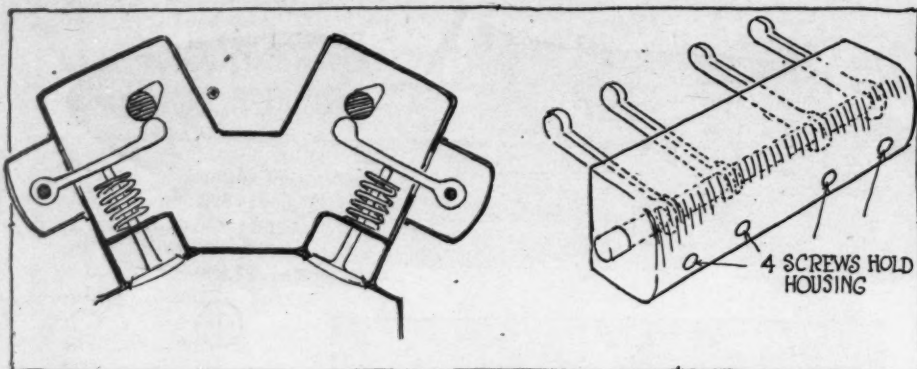
#### Cars Seem to Be Speedy

Those cars which have made their appearance on the track to date are decidedly fast. Ralph DePalma has been working his Ballot at the rate of 95 to 100 m.p.h. Chassaigne, also in a Ballot, has made several laps at better than 95 m.p.h. These Ballot cars are a redevelopment of the four Ballot jobs that were here last year, except, of course, that they are smaller as regards piston displacement. They are very light in weight, with the majority of the weight carried at an exceptionally low center of gravity. The three cars are representative of European practice in that the driver's seat was placed rather high. Ralph DePalma has rebuilt the seating arrangement in his car, lowering it, which gives the car a smarter appearance.

The engines in the Ballot cars are carried in a sub-frame made of a chan-



1. Rene Thomas's Ballot. 2. L. Chevrolet's Monroe looks like a bullet in flight. 3. The Peugeot has all the refinements of the thoroughbred racer. 4. The Ballot De Palma will pilot. 5. Porporato's Gregoire. 6. One of the older Peugeots to be toolled by Howard



Two overhead camshafts operate the sixteen valves on the Monroe engine. Four valves are operated from the rocker arms contained in each housing. The whole affair is extremely accessible and allows a ready examination of the valves and valve springs

nel section. The section being practically a part of the crankcase reinforces the engine base and gives it great rigidity. The two camshafts which are overhead are carried on the sides of the engine head, giving the appearance of the letter Y. At the rear of each camshaft is provided a step-up gear which drives the magnetos. One magneto is provided for each set of four cylinders.

The steering gear and front axle layout of the Ballot cars has been very carefully designed to eliminate air re-

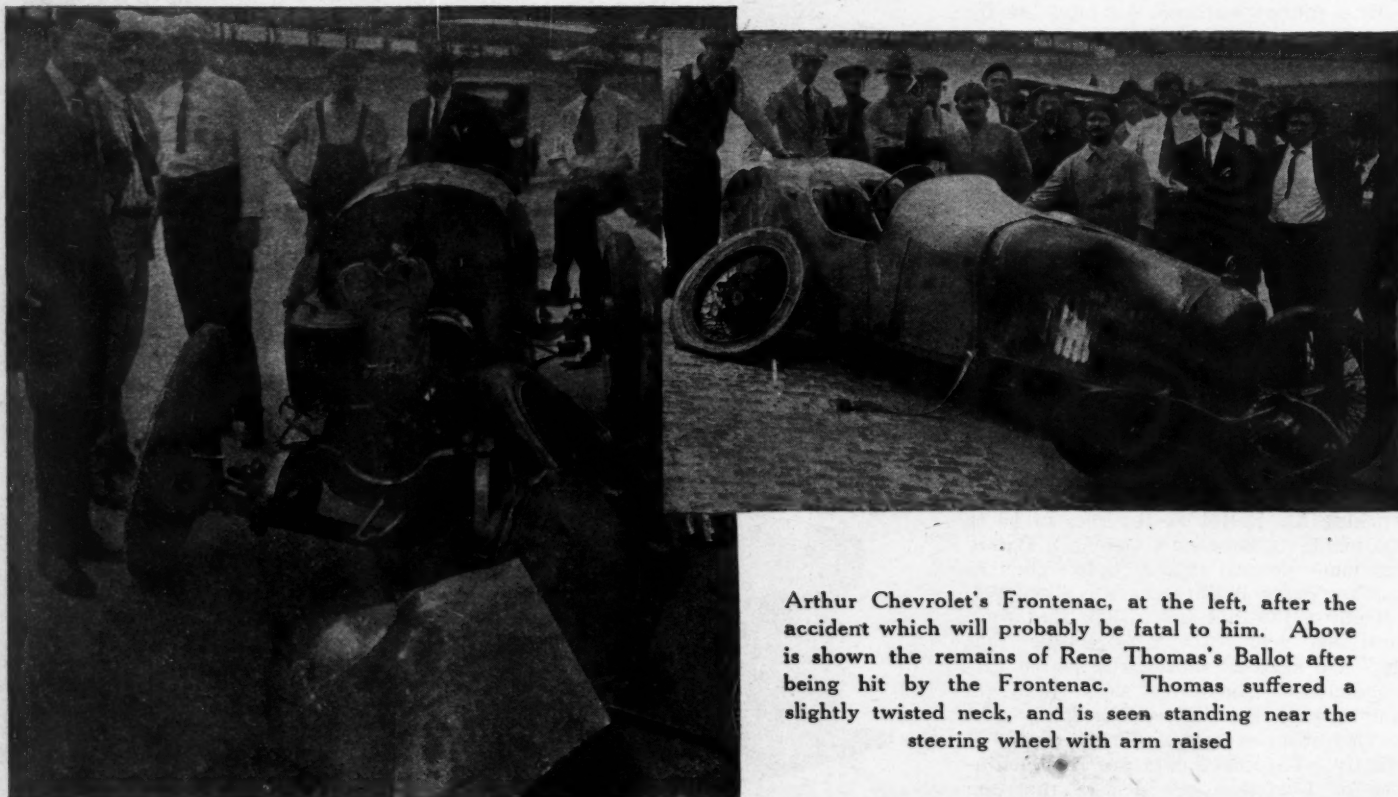
sistance. Wood additions have been secured to the axle and to the tie rods, giving a true stream line effect to these members. The tail of the car is somewhat similar to the Packard which Ralph DePalma drove last year. It will be remembered that the Ballot cars of last year were not provided with stream line tails, but had the gasoline tank set on the rear in plain view.

Louis Chevrolet's latest ideas are represented in the Frontenac and Monroe cars. The three Frontenacs and four

Monroes are similar in all respects, from wheelbase to spark plug equipment. The four-cylinder engine employed is of peculiar design. Two overhead camshafts are used to operate the sixteen valves. These camshafts operate small push rods at an angle of about 25 deg., and these push rods operate the valves. In order to eliminate the side thrust on the valves, small, peculiar shaped rocker arms are used intermediate between the cams and the valves. These rocker arms are pivoted at their ends on a shaft, which is contained in a small aluminum housing held fast by ten screws. Two of these housings are placed longitudinally on the camshaft housing. Four valves are operated from the rocker arms contained in each housing. This arrangement is extremely accessible and provides a ready means for determining the condition of the valves and valve springs.

The frame employed on these seven cars designed by Chevrolet is so laid out that the springs are carried outside of the channel and shackled to bolts supported by a cross member at the front of the front spring and a built-up connection at the rear of the front spring. The front of the rear spring is supported upon a truss-like arrangement built up of steel plate. The frame being very narrow, it was necessary to bend the rear section supporting the rear of the rear spring in an outward direction in

## Arthur Chevrolet Seriously Hurt in Accident



Arthur Chevrolet's Frontenac, at the left, after the accident which will probably be fatal to him. Above is shown the remains of Rene Thomas's Ballot after being hit by the Frontenac. Thomas suffered a slightly twisted neck, and is seen standing near the steering wheel with arm raised

**I**NDIANAPOLIS, May 23—The first accident to befall any of the race drivers at the Indianapolis oval this season was visited upon Arthur Chevrolet, who is in such serious condition that he is ex-

pected to die. As a result of the accident two cars are out of the race, Arthur Chevrolet's red Frontenac and Rene Thomas's Ballot. The two cars collided on the turn, leaving the home stretch

after Rene Thomas in the Ballot had turned around two times as a result of a blown tire.

It was the first time in this season's  
(Concluded on page 17.)



# Technical Specifications of Cars in Indianapolis Race

(Because only a few of the cars had made their appearance when these figures were obtained, this table is necessarily incomplete. The complete and corrected table will appear in Motor Age for June 3)

CAR	DRIVER	CYLINDERS		Bore and Stroke	P. Dis.	VALVES		Ignition	Carb-uretor	Wheel Base	Gear Ratio	Tire and Size	Tire Make	Wheels	Plugs	Shock Absorber	Motor-meter	Chassis Lubrication
		No.	Cast	Arrangement		No.	Loca-tion											
Frontenac	Arthur Chevrolet	4	block	line	182.5	16	head	2 Overhead Rods	Delco	Miller	98	3 to 1	32x4 1/2	Rudge	Mosier	Hartford	Yes	Alemite
Frontenac	Joe Boyer	4	block	line	182.5	16	head	2 Overhead Rods	Delco	Miller	98	3 to 1	32x4 1/2	Rudge	Mosier	Hartford	Yes	Alemite
Frontenac	Art Klein	4	block	line	182.5	16	head	2 Overhead Rods	Delco	Miller	98	3 to 1	32x4 1/2	Rudge	Mosier	Hartford	Yes	Alemite
Monroe	Louis Chevrolet	4	block	line	182.5	16	head	2 Overhead Rods	Delco	Miller	98	3 to 1	32x4 1/2	Rudge	Mosier	Hartford	Yes	Alemite
Monroe	Gaston Chevrolet	4	block	line	182.5	16	head	2 Overhead Rods	Delco	Miller	98	3 to 1	32x4 1/2	Rudge	Mosier	Hartford	Yes	Alemite
Monroe	Roscoe Scales	4	block	line	182.5	16	head	2 Overhead Rods	Delco	Miller	98	3 to 1	32x4 1/2	Rudge	Mosier	Hartford	Yes	Alemite
Monroe	Joe Thomas	4	block	line	182.5	16	head	2 Overhead Rods	Delco	Miller	98	3 to 1	32x4 1/2	Rudge	Mosier	Hartford	Yes	Alemite
Peugeot	Rav Howard	4	block	line	182.0	16	head	2 Overhead Rods	Simms	Miller	105	16 to 44	32x4 1/2	Goodyear Cord	Mosier	Hartford	Yes	Alemite
Peugeot	Jules Goux	4	block	line	181.7	20	head	3 Overhead Rods	Simms	Miller	105	16 to 44	32x4 1/2	Goodyear Cord	Mosier	Hartford	Yes	Alemite
Peugeot	Andre Bollot	4	block	line	181.7	20	head	3 Overhead Rods	Simms	Miller	105	16 to 44	32x4 1/2	Goodyear Cord	Mosier	Hartford	Yes	Alemite
Peugeot	Howard Wilcox	4	block	line	181.7	20	head	3 Overhead Rods	Simms	Miller	105	16 to 44	32x4 1/2	Goodyear Cord	Mosier	Hartford	Yes	Alemite
Ballot	Ralph DePalma	8	block	line	181.6	32	head	2 Overhead	French-2	French-2	205CM-104.5	32x4 1/2	Goodyear Cord	R. W.	.....	Hartford	Yes	Alemite
Ballot	J. Chassaigne	8	block	line	181.6	32	head	2 Overhead	French-2	French-2	205CM-104.5	32x4 1/2	Goodyear Cord	R. W.	.....	Hartford	Yes	Alemite
Ballot	Rene Thomas	8	block	line	181.6	32	head	2 Overhead	French-2	French-2	205CM-104.5	32x4 1/2	Goodyear Cord	R. W.	.....	Hartford	Yes	Alemite
Chevrolet Special	R. E. Durant	8	block	line	181.6	32	head	2 Overhead	French-2	French-2	205CM-104.5	32x4 1/2	Goodyear Cord	R. W.	.....	Hartford	Yes	Alemite
Duesenberg Special	Thomas Milton	8	block	line	181.5	32	side	Side Rocker Arms	Delco	Miller	.....	.....	.....	.....	.....	Hartford	Yes	Alemite
Duesenberg Special	Jimmy Murphy	8	block	line	181.5	32	side	Side Rocker Arms	Delco	Miller	.....	.....	.....	.....	.....	Hartford	Yes	Alemite
Oldfield Special	Waldo Stein	4	block	line	182	16	head	2 Overhead Rods	.....	Miller	.....	.....	.....	.....	.....	Hartford	Yes	Alemite
Revere Special	Tom Rooney	8	block	line	182	32	side	Side Rocker Arms	.....	Miller	.....	.....	.....	.....	.....	Hartford	Yes	Alemite
Gregoire Special	Jean Porporato	4	block	line	181.8	32	side	Side Rocker Arms	.....	Miller	.....	.....	.....	.....	.....	Hartford	Yes	Alemite
Gregoire Special	Jack Seales	4	block	line	181.8	32	side	Side Rocker Arms	.....	Miller	.....	.....	.....	.....	.....	Hartford	Yes	Alemite
Philbrin Special	Ira Vail	8	block	line	181.5	32	side	Side Rocker Arms	Philbrin	Miller	.....	.....	.....	.....	.....	Hartford	Yes	Alemite
Ellingboe Special	Jules Ellingboe	8	block	line	181.5	32	side	Side Rocker Arms	.....	Miller	.....	.....	.....	.....	.....	Hartford	Yes	Alemite
Ellingboe Special	C. Glenn Howard	8	block	line	181.5	32	side	Side Rocker Arms	.....	Miller	.....	.....	.....	.....	.....	Hartford	Yes	Alemite
Kenworthy Special	Kurt Hittke	8	block	line	181.5	32	side	Side Rocker Arms	Delco	Miller	.....	.....	.....	.....	.....	Hartford	Yes	Alemite
Duesenberg Special	Eddie O'Donnell	8	block	line	181.5	32	side	Side Rocker Arms	.....	Miller	.....	.....	.....	.....	.....	Hartford	Yes	Alemite
Duesenberg Special	Eddie Hearne	8	block	line	181.5	32	side	Side Rocker Arms	.....	Miller	.....	.....	.....	.....	.....	Hartford	Yes	Alemite
Richards Special	John R. Bolling	8	block	line	181.5	32	side	Side Rocker Arms	.....	Miller	.....	.....	.....	.....	.....	Hartford	Yes	Alemite
Mulford Special	Ralph Mulford	8	block	line	181.5	32	side	Side Rocker Arms	.....	Miller	.....	.....	.....	.....	.....	Hartford	Yes	Alemite
Meteor Special	Willie Haupt	8	block	line	181.5	32	side	Side Rocker Arms	.....	Miller	.....	.....	.....	.....	.....	Hartford	Yes	Alemite
T. N. T. Special	Frank Elliott	4	block	line	180	16	head	.....	.....	Miller	.....	.....	.....	.....	.....	Hartford	Yes	Alemite
Revere Special	Not Named	8	block	line	181.5	32	side	Side Rocker Arms	.....	Miller	.....	.....	.....	.....	.....	Hartford	Yes	Alemite

## FACTS ABOUT THIS YEAR'S RACE AT INDIANAPOLIS BRIEFLY TOLD

Distance—500 miles.

Purse—\$50,000; \$20,000 to first; \$10,000 to second; \$5,000 to third; \$3,500 to fourth; \$3,000 to fifth; \$2,200 to sixth; \$1,800 to seventh; \$1,600 to eighth; \$1,500 to ninth; \$1,400 to tenth.

Added prizes—\$20,000 added by Indianapolis business men, \$100 to leader at end of each lap; \$15,000 added by accessory manufacturers to winners using their products.

Race starts—10 a. m.

Probable duration—About five and one-half hours.

Total number of entries—32; probable starters, 29.

Grandstand accommodates 60,000 persons; parking spaces accommodate 200,000; expected attendance, 125,000.

Track measures 2 1/2 miles to the lap, is 60 ft. wide with 2000 ft. turns banked at angle of 16 deg.

Former Winners

	M.P.H.
1911 R. Harroun (Marmon)	74.49
1912 J. Dawson (National)	78.72
1913 J. Goux (Peugeot)	75.92
1914 R. Thomas (Delage)	82.47
1915 R. De Palma (M'c'd's)	89.84
1916 Dario Resta (Peugeot)	84.05
1910 H. Wilcox (Peugeot)	87.95

order that the spring pads of the axles would be as close to the outside as possible.

A great deal of tuning up has been going on with all of these seven cars. Different timing is being tried out, and apparently some of the tryouts have produced satisfying results, for the speed has been very fast.

There have been so few cars on the track to date that it is impossible to give a representative statement concerning the relative speed possibilities of the cars. However, all of them are faster by at least ten miles than the speed at which the race will probably be won. The track is not in the best condition. The hollow at the turn leaving the home stretch is still existent and the drivers are very cautious when entering this turn.

It seems as if the entrants are trying to force a winner through by combination and strategy. The entry list includes three Ballots, four Monroes, three Frontenacs, three Peugeots, two Gregoires, four Duesenbergs and six other Duesenberg engine cars entered by individuals. There are also other individual cars entered singly. The master drivers from the four corners of the earth are present. Included in the list of drivers is Jimmy Murphy, who recently obtained a speed of 157 m.p.h. at Daytona, and who won the Los Angeles race.

# Statistical Evidence of Indianapolis Races

250 500 750 1000 1250 1500 1750 2000 2250 2500 2750

WILCOX	2610 MILES
MULFORD	2250
MERZ	1562.5
DEPALMA	1532.5
GOUX	1000
GUYOT	1000
E. COOPER	500
O'DONNELL	500
THOMAS	500
ECHEVROLET	200

Here are shown the number of miles covered by various drivers who have competed in the Indianapolis races. By winning last year's race Wilcox gets the credit for having driven the greatest number of miles over the Hoosier oval

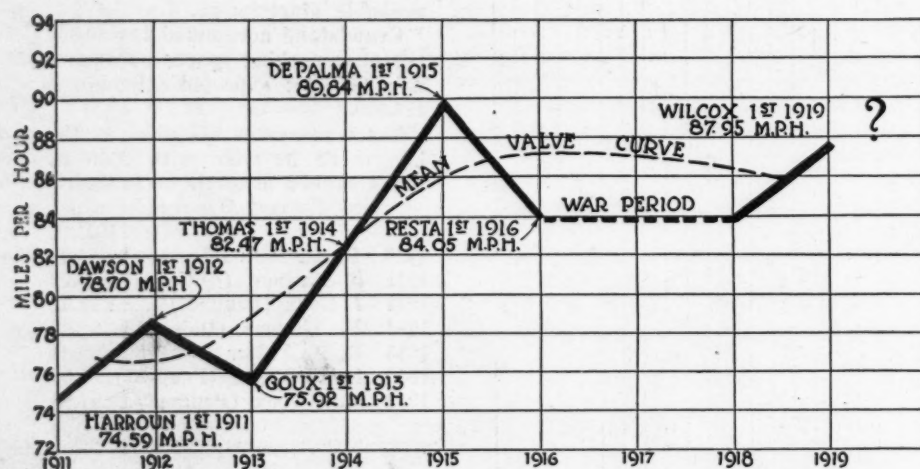


Chart of winners' speeds shows a constant increase up to the year 1916. From there on the average miles per hour has gone up and down each year, never attaining the 89.84 miles per hour set by De Palma in 1916. The indication for this year's speed according to the mean value curve is a downward trend

OF the seven races which have been run on the Indianapolis track three have been won by the Peugeot, once piloted by an American, Wilcox, and twice by foreigners, Goux and Resta, although the latter now lives in this country.

In the matter of miles traveled by various makes of cars, Stutz leads with a total of 5,564 miles. The Stutz team in 1915 created a sensation for its consistent team work, and largely was responsible for putting at the top of the list of consistent performers. By winning last year's race the Peugeot has gained on the Stutz, but to surpass the latter's record it will be necessary for at least three of the French cars to finish this year, which would give them a total of 5,950 miles. With no Stutz cars entered in this year's race there is a possibility of the honor of having covered the greatest number of miles on the Hoosier oval going to the Peugeots.

To Howdy Wilcox belongs the credit of having driven the greatest number of miles at Indianapolis, which record up to last year was held by Ralph Mulford. There is a possibility of Wilcox and Mulford changing positions on the chart this year, for should Mulford drive the entire distance this would give him a total of 2,750 miles. This means Wilcox would have to drive at least 140 miles in this year's race to break even.

0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000

STUTZ	5564 MILES
PEUGEOT	4450
MERCEDES	3230
MERCEDES	3130.5
DUFENBERG	2750
NATIONAL	2432.5
SUNBEAM	2325
MAXWELL	2282
CASE	1775.5
DELAGE	1737.5
FIAT	1507.5
COZIER	1247.5 M.
MASON	1125 M.
SIMPLEX	1148 M.
MARMON	1000 M.
KEPTON	960 M.
JACKSON	915 M.
BENZ	900 M.
CUTTING	900 M.

This chart shows the makes of cars which have gone the greatest number of miles at Indianapolis. Stutz still leads the field by virtue of its consistent team work in 1915. The closest rival to Stutz, the Peugeot, would have to pile up a total of 1,114 miles this season to equal the former's record



# These Have Won the Hoosier Classic



HARROUN 1911



DAWSON 1912



GOUX 1913



THOMAS 1914



DE PALMA 1915

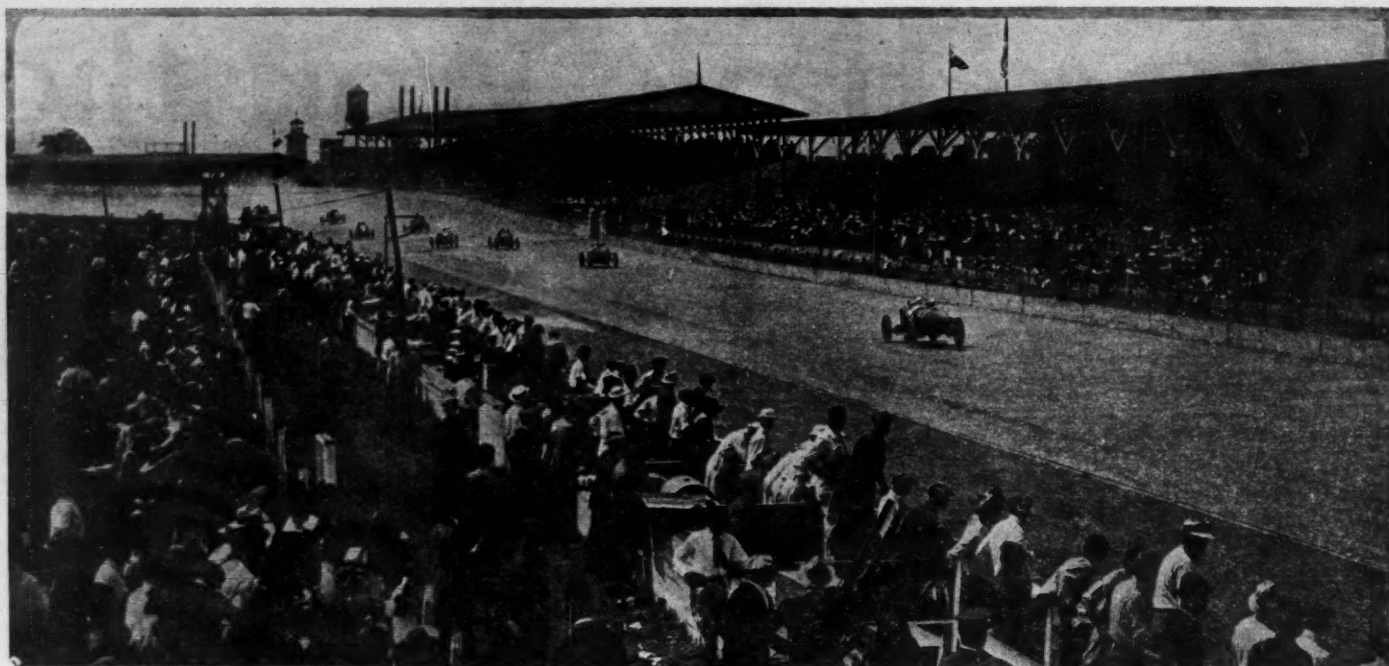


RESTA 1916



WILCOX 1919





## Decade Brings Great Races at Indianapolis

Past Contests Have Firmly Established  
Hoosier Track As Mecca of the  
Automobile Speed World

TEN years old and a veteran! Too young even for the trailing vines to have covered its board fences, yet today the Indianapolis Speedway is the Mecca of automobile engineers not only of the United States but of the whole world. A super anomaly in an industry of anomalies! A baby in years and a patriarch in traditions and accomplishments!

Those are some of the things you may think of when you watch the cars speed around the two and one-half mile brickway this year. It doesn't seem so long ago when we think of 1911 in terms of anything but automobile racing, but when we look back on that first race at Indianapolis, the year that Ray Harroun turned in a victory with his Marmon Wasp, it seems a century ago, and we who saw that never-to-be-forgotten race feel like doddering veterans of a sport.

But in its ten years of life, Indianapolis Speedway has done so many things which have made the time seem longer. Followed by newer and faster speedways whose owners and promoters declared that their tracks spelled the doom of Indianapolis, the Hoosier oval alone survives. Gone are Speedway Park and Sheepshead Bay, whose tracks, much faster and newer, threatened for a minute to eclipse the glories of Indianapolis. Gone is the track at Cincinnati, another rival of a few years ago. Uniontown and Beverly Hills alone survive, and neither of them seriously threatens the pre-eminence of Indianapolis as the home of speed.

Indianapolis' opening race in 1911 was a fitting inaugural for a track destined to become the speed center of the automobile world. For it brought a finish unequalled in a sport which abounds in the spectacular, the first five cars to cross the line flashing over the tape within thirteen minutes of each other. Such a finish in a great automobile race was never seen before, nor has one so close ever been seen since at Indianapolis.



Indianapolis spells the progress of automobile engineering for the last decade. In the races at Indianapolis you can trace the gradual development of the multi-cylinder engine. You can trace the growing strength of the light weight car. You can trace how Europe has learned something from America in automobile engineering, returned to teach America something more and again learned something from its former pupil and erstwhile teacher.

Seven races have been run in the ten years that Indianapolis race-track has been in existence, 1918 and 1919, seeing a lapse because of America's participation in the World War. Each of the seven races has had its own lesson to teach. Considered strictly as a sporting event, the Indianapolis race has drawn bigger crowds than any other event in American sport. Considered as a lesson to an industry, it draws more distinguished American and European engineers than any other race in motordom.

This year's race will bring forth new principals. Unlike last year's event, in which all except one team of cars were of a vintage of six or seven years ago, every car in this year's race is a brand new job. Only one is a veteran, and this one has been rebuilt so that now all that is left of the old car is its name. And these new cars embody new principles of engineering, all to undergo their first trial; a trial under the supervision of the greatest automobile engineers of the world.

To Ray Harroun at the wheel of the Marmon Wasp went the major honors of the day, but those honors must be shared by Cyrus Patschke, Harroun's relief driver. After driving a wild race for the first 150 miles, Harroun turned his car, then in second place, over to Patschke, his relief driver, and the substitute in the next 100 miles had crept into first place, giving back the car to Harroun in a comfortable position.

The finish was one of the most spec-



tacular on record. Harroun flashed over the wire just one minute and forty-three seconds before the checkered flag was given to Ralph Mulford and his Lozier. Eight minutes and thirty-eight seconds later David Bruce-Brown thundered over the wire for third and Spencer Wishart and Joe Dawson closely followed for fourth or fifth, Dawson finishing less than thirteen minutes after Harroun had won the race.

Dawson's finish was the most spectacular of the day. Toward the end of the race he had had a collision with another car and the radiator of his Marmion was so badly smashed that it would not hold water. With oil as the only cooling agent he continued the race and had scarcely crossed the finish line than his engine stuck from the heat and could not be started.

Several accidents marked the race, but only one resulted fatally.

Samuel Dickson, mechanic, was killed when Art Greiner's Amplex lost tire and rim and turned over. Greiner himself escaped with some minor bruises. Dave Lewis, then a mechanic for Harry Grant, had his leg broken in a collision with Louis Disbrow's Pope-Hartford. Several other minor accidents also occurred.



To the veteran of Indianapolis races, 1912 will always be known as the year of Ralph De Palma's Jinx. For with the race apparently won and leading the field by more than eleven minutes, De Palma's Mercedes developed engine trouble on the next to the last lap and refused to move. With tragedy in their faces, De Palma and his mechanic pushed their car around to the pits while the whole throng of spectators seemed to unite in a groan of sympathy.

With De Palma out of the way, Joe Dawson, at the wheel of a National, was in a commanding position and wheeled over the line a comparatively easy winner, more than eighteen minutes ahead of Teddy Tetzlaff in a Fiat. Dawson's time was a new record for the race, more than twenty minutes faster than Harroun's winning time of the year before. Dawson's victory was an intensely popular one, despite the sympathy felt for De Palma in his unfortunate accident. Joe was an Indianapolis boy and the car he drove was an Indianapolis built machine and before a crowd which was made up principally of Hoosiers, the victory for this combination brought an enthusiasm which has been unparalleled in any other races. Incidentally, Dawson's victory in this year was the last gained by an American built machine.

The 1912 race was comparatively free from accidents, the only approach to a serious mishap coming when a rear wheel of Burman's Cutting collapsed, but, fortunately, neither Burman nor his mechanic were injured.



1913 witnessed the start of the invasions of European built cars and victory in the big race went to Jules Goux in the French Peugeot. It was some consolation to the American entries that Goux' time of 6:35:05.00 was nearly fourteen minutes slower than Dawson's the previous year but to discount this consolation was the fact that the piston displacement limit had been lowered from 600 cu. in., which ruled for the 1911 and 1912 races, to 450 cu. in. for the 1913 race. Furthermore, second and third places were taken by Wishart in a Mercer and Merz in a Stutz, the rest of the European entries trailing these two American made cars.

The race abounded in the spectacular. For virtually the entire distance the winning Peugeot was engaged in a duel with Bob Burman's Keeton and this contest did not end until Burman was forced to drop back when his Keeton's carbureter caught fire.

Another spectacular incident occurred when Mulford's car ran out of fuel on the backstretch and his mechanic sprinted a full mile across the fields of the infield to the Mercedes pit where he dropped unconscious after telling of Mulford's plight. The effort put the Mercedes in the money. To cap the list of sensations, Charley Merz, who took third place with his Stutz, drove the last lap with his car a mass of flames.

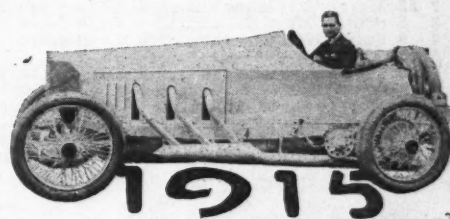


America was completely out of the running in the spectacular race of 1914 in which Rene Thomas at the wheel of a French built Delage set a new record of 6:03:45, nearly four miles an hour better than the old record held by Joe Dawson and the National.

From start to finish the race proved to be a duel between the teams representing two French manufacturers, Peugeot and Delage. There was an intense enmity between these two teams and the race brought out all the best driving in both. First the Peugeot

and then the Delage forged ahead. Thomas, captain of the Delage team, and Duray, captain of the Peugeot, indulging in particularly bitter contests. Thomas had a little the better fortune, however, and flashed over the line seven minutes ahead of his rival, third place going to Guyot in another Delage and fourth to Jules Goux in the second Peugeot. Fifth place went to Barney Oldfield in a Stutz while sixth went to the Belgian Excelsior and seventh to the English Sunbeam. With six of the ten money positions and the old American record smashed to bits, there was little consolation for America in the race.

This year also was marked by one of the most unfortunate accidents which has occurred on the Indianapolis track and which marked the end of the racing career of Joe Dawson, winner in 1912. A comparatively new driver, Gilhooley, wrecked his car on one of the turns and Dawson and Wilcox, coming close behind him, seemed certain to pile up. Wilcox managed to avert an accident by skillful manoeuvring but by the time Dawson had come up to the wreck, Gilhooley's mechanic had crawled onto the track and in trying to avoid him, Dawson crashed into the bank. Dawson's neck was broken but after several months in the hospital he finally was pronounced out of danger but never has been permitted to resume his racing career.



It was not until 1915 that Ralph De Palma obtained a salve for his misfortune of 1912. In the meantime a new racing star had flashed over the American firmament in Dario Resta who in his first two starts in this country had taken first places in the Vanderbilt and Grand Prix races. De Palma and Resta were the outstanding favorites for the 1915 race and they justified the faith put in them, for the grind early resolved into a duel between the two.

First one and then the other forged ahead, De Palma always seeming to have a trifle the advantage until within a few laps of the finish Resta's steering gear went wrong and De Palma came into a comparatively easy victory, with his Mercedes. Although the piston displacement limit for the 1915 race had again been lowered to 300 cu. in. as against 450 cu. in. the two previous years, De Palma smashed the previous year's record to bits, wheeling his mount across the line in 5:33:55.51, an average rate of speed of 89.94 m.p.h.

Not only did De Palma smash the previous record but the next three cars in order did likewise, Resta in the Peugeot and Anderson and Cooper in Stutzes all

# How They Finished in Years Gone By

## STATISTICS OF THE 1911 500-MILE RACE

Open to cars with a piston displacement of 600 cubic inches or under.

Pos. No.	Car and driver	Cylinder	Bore	Stroke	Piston displ.	Time	M. P. H.
1	32 Marmon, Harroun	6	4 1/4	5	447.1	6:42:08	74.59
2	33 Lozier, Mulford	4	5 5/8	6	544.6	6:43:51	74.29
3	28 Fiat, Bruce-Brown	4	5	7 1/2	589.0	6:52:29	72.73
4	11 Mercedes, Wishart	5	5 1/2	7 1/2	580.2	6:52:57	72.65
5	31 Marmon, Dawson	4	4 5/8	7	445.3	6:54:34	72.34
6	2 Simplex, R. de Palma	4	5 5/8	5 3/4	597.2	7:02:02	71.13
7	20 National, Merz	4	5	5 11/16	436.8	7:06:20	70.37
8	12 Amplex, Turner	4	5 5/16	5	443.3	7:15:56	68.82
9	15 Knox, Belcher	6	5	4 3/4	559.1	7:17:09	68.62
10	25 Jackson, Cobe	4	5	5 1/2	431.9	7:21:50	67.90
11	10 Stutz, Anderson	4	4 3/4	5 1/2	489.9	7:22:55	67.73
12	36 Mercer, Hughes	4	4 3/4	5	300.7	7:23:32	67.62

## STATISTICS OF THE 1912 500-MILE RACE

Open to cars with a piston displacement of 600 cubic inches or under.

Pos. No.	Car and driver	Cylinder	Bore	Stroke	Piston displ.	Time	M. P. H.
1	8 National, Dawson	4	5	6 1/4	490.8	6:21:06	78.7
2	3 Fiat, Hetzlaff	4	5	7 1/2	589.0	6:39:25	76.6
3	21 Mercer, Hughes	4	4 3/4	5	300.7	6:33:09	76.3
4	20 Stutz, Merz	4	4 3/4	5 1/2	389.9	6:34:40	76.0
5	18 Schacht, W. Endicott	4	4 3/4	5 1/2	389.9	6:46:28	73.3
6	2 Stutz, Zengel	4	4 3/4	5 1/2	389.9	6:48:31	73.2
7	14 White, Jenkins	6	4 1/4	5 3/4	489.4	6:52:38	72.7
8	22 Lozier, Horan	4	4 3/4	6	544.6	6:59:38	71.4
9	9 National, Wilcox	4	5	7 1/2	589.0	7:11:30	69.6
10	19 Knox, Mulford	6	4.8	5 1/2	597.16	8:53:00	56.2

## STATISTICS OF THE 1913 500-MILE RACE

Open to cars with a piston displacement of 450 cubic inches or under.

Pos. No.	Car and driver	Cylinder	Bore	Stroke	Piston displ.	Time	M. P. H.
1	16 Peugeot, Goux	4	4.246	7.875	448.13	6:35:05.00	76.92
2	22 Mercer, Wishart	4	4.370	5.000	299.00	6:58:13.40	73.49
3	2 Stutz, Merz	4	4.813	5.500	399.97	6:48:49.25	73.38
4	9 Sunbeam, Guyot	6	3.540	6.290	367.52	7:02:58.95	70.92
5	23 Mercedes-Knight Pilette	4	3.937	5.118	251.33	7:20:13.00	68.14
6	12 Gray Fox, Wilcox	4	4.750	5.500	389.90	7:23:26.55	67.65
7	29 Mercedes, Mulford	4	4.489	7.087	448.66	7:28:05.50	66.95
8	31 Case, Disbrow	4	5.100	6.500	449.00	7:29:09.00	63.08
9	35 Mason, Haupt	4	4.316	6.000	350.50	7:52:35.10	63.47
10	25 Tusla, Clark	4	4.752	5.500	340.10	7:56:14.25	62.99

finishing in faster time than Thomas' old record.

The achievement of the Stutz as a team was the most notable of the day, despite the fact that they could not achieve victory. Stutz started three cars in the race and all finished in the money, taking third, fourth and seventh places respectively. Howdy Wilcox made the running with Resta and De Palma most of the race but his car developed engine trouble and he finished in seventh place with only two of his cylinders firing.

The growth of new speedways, notably in Chicago and New York, had a deterrent effect on the Indianapolis attendance in 1915 and for 1916, the classic was shortened to 300 miles. It was believed that the shorter race would prove more popular, as many persons held that it was too wearisome to sit through nearly six hours of racing.

Duesenberg finished two of his three entries in the money, O'Donnell taking fifth and Tom Alley eighth. Bob Burman, who was killed later in the year, succeeded in finishing the race for the first time.

## STATISTICS OF THE 1914 500-MILE RACE

Open to cars with a piston displacement of 450 cubic inches or under.

Pos. No.	Car and driver	Cylinder	Bore	Stroke	Piston displ.	Time	M. P. H.
1	16 Delage, Thomas	4	4.13	7.08	380.2	6:03:45	82.47
2	14 Peugeot, Duray	4	3.07	6.18	183.0	6:10:24	80.99
3	10 Delage, Guyot	4	4.13	7.08	380.2	6:14:01	80.20
4	6 Peugeot, Goux	4	3.94	7.08	345.0	6:17:24	79.41
5	3 Stutz, Oldfield	4	4.80	6.00	434.3	6:23:51	78.15
6	9 Excelsior, Christiaens	6	3.80	6.20	446.6	6:27:24	77.44
7	27 Sunbeam, Grant	6	3.14	5.90	273.0	6:36:22	75.69
8	5 Beaver Bullet, Keene	4	5.10	5.50	449.4	6:40:57	74.82
9	25 Maxwell, Carlson	4	4.20	8.00	445.3	7:02:42	70.96
10	42 Duesenberg, Rickenbacker	4	4.40	6.00	360.5	7:03:34	70.83

## STATISTICS OF THE 1915 500-MILE RACE

Open to cars with piston displacement of 300 cubic inches or under.

Pos. No.	Car and driver	Cylinder	Bore	Stroke	Piston displ.	Time	M. P. H.
1	2 Mercedes, R. de Palma	4	3.620	6.500	274.0	5:33:55.51	89.84
2	3 Peugeot, Resta	4	3.620	6.670	276.0	5:37:24.94	88.91
3	5 Stutz, Anderson	4	3.800	6.480	295.3	5:52:27.58	87.60
4	4 Stutz, E. Cooper	4	3.800	6.480	295.3	5:46:19.36	87.11
5	15 Duesenberg, O'Donnell	4	3.980	6.000	299.0	6:08:13.27	81.47
6	8 Peugeot, Burman	4	3.650	7.100	296.0	6:13:19.61	80.36
7	1 Stutz, Wilcox	4	3.816	6.484	298.5	6:14:19.73	80.14
8	10 Duesenberg, Alley	4	3.980	6.000	299.0	6:15:08.01	79.97
9	19 Maxwell, Carlson-Hughes	4	3.750	6.750	298.0	6:19:55.90	78.96
10	7 Sunbeam, von Raalte	4	3.700	6.300	274.0	6:35:23.43	75.79

## STATISTICS OF THE 1916 300-MILE RACE

(300 miles, limited to cars of 300 cubic inches piston displacement.)

Pos. No.	Car and driver	Cylinder	Bore	Stroke	Piston displ.	Time	M. P. H.
1	17 Peugeot, Resta	4	3.6	6.6	274	3:34:17.51	84.05
2	1 Duesenberg, D'Alene	4	3.75	6.75	298.2	3:36:15.28	83.25
3	10 Peugeot, Mulford	4	3.6	6.6	274	3:37:56.20	82.65
4	14 Sunbeam, Christiaens	4	3.21	6.14	294	3:46:36.03	79.45
5	15 Delage, Oldfield	4	3.70	6.30	294	3:47:19.63	79.20
6	4 Maxwell, Henderson	3	3.87	6.37	299.5	3:49:56.48	78.35
7	29 Premier, Wilcox	4	3.66	6.25	278.8	3:54:31.31	76.85
8	26 Crawford, Johnson	4	3.76	6.75	298.8	4:01:54.75	74.45
9	24 Crawford, Chandler	4	3.76	6.75	298.8	4:02:42.38	74.05
10	9 Osteweg, Haibe	4	4.34	5.00	296.4	4:03:10.51	73.85
11	12 Ogren, Alley	4	3.75	6.75	298.2	4:04:47.10	73.60

Expectations were that the 1916 race would develop into another duel between De Palma and Resta but De Palma had smashed down his car the previous week at Chicago and was therefore unable to start. The rest of the field was of mediocre speed and Resta was at no time forced to extend himself. He undoubtedly might have made better time had he chosen, but with the rest of the field hopelessly outclassed,

he did not take any chances of mechanical trouble and set a steady, consistent pace which he maintained throughout the race.

The effects of the war for the first time became manifest on the Hoosier race and the interest in the event as well as the class of cars entered was far below that of previous seasons. There were virtually no new machines in the race, Resta's Peugeot being the same car he had campaigned all through the previous year and which had already seen two hard seasons' work. Most of the cars entered in the race were of American manufacture, with a few of the European cars which had been caught here by the outbreak of war, tuned up and started at the grind.

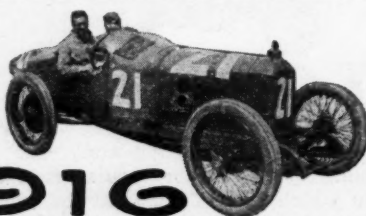
## STATISTICS OF THE 1919 500-MILE RACE

Open to cars with a piston displacement of 300 cubic inches or under.

Pos. No.	Car and driver	Cylinder	Bore	Stroke	Piston displ.	Time	M. P. H.
1	3 Peugeot, Wilcox	4	3.6	6.7	274.6	5:40:42.87	87.95
2	14 Durant, Hearne	4	3.81	6.5	298.6	5:44:29.04	87.00
3	6 Peugeot, Goux	4	3.6	6.7	274.6	5:49:06.18	85.20
4	32 Ballot, Guyot	8	2.9	5.5	296	5:55:16.27	84.35
5	26 Bender, Alley	4	3.62	7	289	6:05:03.92	82.20
6	4 Packard, De Palma	12	2.65	4.5	299.2	6:10:10.64	81.05
7	7 Frontenac, L. Chevrolet	4	3.87	6.37	299	6:10:10.92	81.00
8	27 Hudson, Vail	6	3.5	5	288.6	6:12:42.00	80.35
9	41 Frontenac, G. Chevrolet	4	3.87	6.37	299	6:17:21.79	79.45
10	31 Ballot, Thomas	8	2.9	5.5	296	6:21:10.92	78.75
11	8 Stutz, Cooper	4	3.81	6.5	298	6:21:35.05	78.60

# 1916

Dario Resta had a joy-ride in winning the 1916 race, which had been abbreviated to only 300 miles, and there was not sufficient speed in the rest of the field even to make him extend his Peugeot. Resta finished the shortened distance in 3:34:15.71, considerably slower, as judged on a miles per hour basis, than De Palma had won the race in the previous season.







After a lapse of two years on account of America's participation in the World War, an attempt was made to revive the racing game at Indianapolis with another 500-mile race. From a viewpoint of interest and attendance it was a big success, but these were the only two particulars in which it was even partly so. For aside from the satisfaction Americans might take in the fact that the race was won by an American, Howdy Wilcox, the race was a complete failure.

Several reasons contributed to this failure. First, with the exception of one team, the cars entered were of a vintage

of several years previous—in fact the wonder was, not that some of these cars were extremely slow, but rather that a great many of them were able to run at all, in view of the hard knocks they had received in their long careers. Second, an inconceivable blunder kept the only new cars in the race from figuring seriously in the result.

Ballot, a French manufacturer, was the only one who had a team of new cars in the race. Considerable interest attached to these machines, for they embodied a new idea in racing cars with eight cylinders in a row. They had shown extreme speed in practice and gave every indication of having the race "sewed up." At the last minute, however, Rene Thomas, captain of the Ballot team, changed the wheels on the cars and the resultant change in gear ratios caused so much wheel trouble to the cars in the race that they never were serious contenders.

Wilcox's victory was popular, as he was an Indianapolis driver, and was com-

paratively easily gained. Howdy drove a steady, consistent race, knowing that his mount was faster than any other machines in the contest with the exception of the Ballots and the minute these were forced out with their wheel and tire troubles that the race was as good as won.

The race was the bloodiest in the history of the Hoosier speedway. Three men were killed outright on the track while a fourth died a few days later as the result of injuries suffered. Louis LeCocq and his mechanic were killed when LeCocq's Roamer overturned and caught fire; Arthur Thurman was killed when his own Special was overturned while Shannon died as the result of the most peculiar accident of the day. When Louis Chevrolet came across the line with one wheel gone from his car, the scraping axle cut the wire timing line which flew back and hit Shannon, who was close behind, severing his jugular vein and causing injuries from which he later died.

### ARTHUR CHEVROLET INJURED

(Continued from page 10)

practice spins that three cars were on the track at the same time and bunched together in a little friendly competition. Ralph De Palma in his yellow colored Ballot was leading the three cars around the track. Rene Thomas, in another Ballot, was trailing De Palma by a few yards; and directly back of Thomas was Arthur Chevrolet in the Frontenac. The cars entered the turn with Ralph on the outside and leading. Suddenly Rene Thomas's car blew a tire, the right rear, and the car started to turn. It skidded around two complete turns, then partially straightened out and headed for the stone wall at the top of the track. Here it was deflected off and cut downward across the track, directly in the path of the onrushing Frontenac. The Frontenac going better than ninety-five miles per hour at the time, smashed into the Ballot on the left-hand side and hurled it about thirty feet further down the track, and the Frontenac still going smashed into the Ballot again.

The Frontenac overturned and pinned Arthur Chevrolet between the wheel and the seat, while the car plunged along on its side. Arthur's mechanic, Marcelle

Chevoux, save a general shaking up and a few scratches, came out unhurt. Rene Thomas and his mechanic, Fernando, are not hurt or scratched, except that Thomas had his neck twisted slightly, which he dismissed while he busied himself with straightening out the front wheel. The cars had made several laps before the accident happened and the three were running at about ninety-five miles per hour very consistently, lap after lap.

Because of close adherence to streamline body design, the three Frontenacs, and four Monroe cars, which are identical with the Frontenacs, the drivers of these mounts are forced to remove the steering wheel before entering and getting out. This is especially so when the driver is of such robust build as Arthur Chevrolet.

It was at this exact place on the track that Joe Dawson was injured, since which time he has never appeared in a race. Gilhooly was also injured at this position on the track. It is the most treacherous portion of the whole brick track. Drivers have told the writer that there is something very peculiar about the contour of the track at the position where the home stretch breaks into the turn. There is a tendency for the car to

travel toward the outside concrete wall, just at the beginning of the turn. If the turn is made too quickly, the rear end of the cars seems to be carried upward with the result that unless the exactly true course is steered there is bound to be some skidding. This is probably why so many tires go at this particular spot.

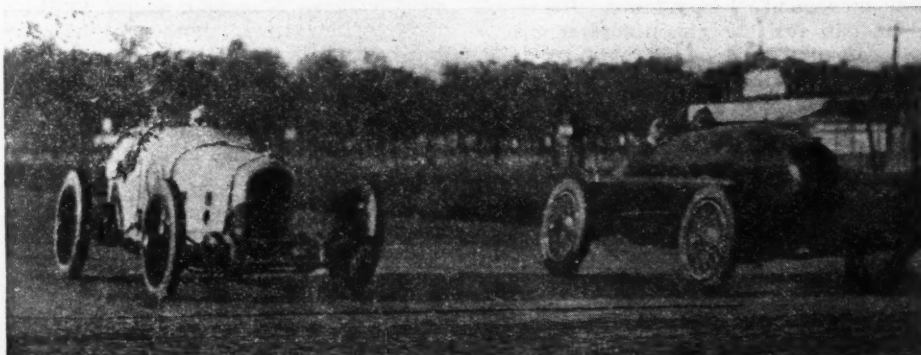
### LIMIT CANADIAN TRUCK LOADS

Toronto, Ont., May 25—Despite the urgent representations and demonstrations of the Ontario Motor Truck Owners' association, in which the truck trade and industry are largely represented and active, the legislature of the Province of Ontario has passed the bill limiting the loads of trucks of more than one ton capacity to half their rated capacity on country roads during the months of March and April, except under special permit.

Moreover, the urged amendments to the motor truck limit stand over. However, as pointed out by Hon. F. C. Biggs, Minister of Public Works and Highways for Ontario, there will be another session of the legislature before the measure, restricting the loads of trucks, comes into effect and that in the meantime it is the government's intention to investigate exhaustively the contentions of the truck owners and then to modify the law accordingly before it becomes operative.

The government desires, he said, to encourage motor transportation and therefore will endeavor to avoid imposing any restrictive measures that are not necessary to the maintenance of efficient highways. As indicative of the minister's open mindedness on the "load" subject it is noteworthy that he has invited the secretary of the Ontario Motor Truck Owners' association to accompany him to Washington where the results of elaborate experiments have been analyzed and tabulated.

Some time ago the association gave a dinner to Hon. F. C. Biggs, at which the proposed measure was discussed.



An interesting brush down the home stretch. De Palma in his Ballot is to the left and Gaston Chevrolet in a Monroe is the other. The speed is about 90 miles per hour

# Making the Shop Profitable With System

Can the Repair Shop Be Made to Pay? The X. R. Gill Co. Says Yes, and Here Is How It Is Accomplished



The salesroom of the X. R. Gill Co., Okmulgee, Okla. Everything in this establishment is kept spotlessly clean. Note the flower boxes around the wall and hanging from the ceiling, giving a touch of color against the white background

**A** GARAGE of to-day must have its system just the same as any successful business. Some check on incoming and outgoing cars. Whether or not they are in storage, in for repairs or both. A storage car can easily get away with a repair job attached if simply left to someone's memory. That someone may be out at the time the car leaves garage. A system should be installed in order that everything may move along regardless of who's on the job.

## Estimate Given on Jobs

On entering the garage of the X. R. Gill Co., Okmulgee, Okla., your trouble is ascertained, job order made out and your signature attached as authorizing the work to be done. A set labor price is given you on this particular job. Material can be estimated by an experienced man. Each job order is made in triplicate; white for the original, yellow for duplicate and white cardboard for triplicate. Each copy bearing the same number. The first and second copies are sent to the stockroom; the cardboard placed in the car and sent to the shop. A green tag showing owner's name, job order number, and by whom released; is placed on the radiator cap held by a rubber or cord. This tag remains on car until settlement by customer has been made and reminds the floor man that this car has a job order against it.

This system makes the man releasing the car responsible for the settlement of the charge. That is, the customer has

*X. R. Gill, the man behind the company of this name, is not yet thirty years old, and has already made large strides toward success with his sales and service station for Fords. Mr. Gill has always been a firm believer in system in the garage. His shop has been made to show a profit with it, and with the thought in mind that his experience may prove a helpful guide to others whose shop now shows a loss, this article is published.*

shown him his paid job order or authority for charging.

One man is placed in charge of the garage or floor and directs the actions and movement of cars there. He is responsible for the cleanliness, courtesy etc. of that department. He, in turn, places a man in charge of the gasoline, oil, water and air. The floor man handles the service calls coming from the outside, for towing in, gas, etc. His is no easy job and requires an even tempered and diplomatic man. He can satisfy many kicks or lose the garage many customers in his treatment toward them.

Think of the garages you have entered and have been met by someone who treats you as if it were a privilege for him to wait upon you. Pick the right man for the right place, it's a job, but it means profit. The garage can make

minor adjustments and leave the heavier jobs for the shop. They have found that an experienced mechanic is best fitted for floor work. He can satisfy the questions of the customer as to the thousands of noises they hear, especially in their first car. This man can quickly show his men what minor adjustment is necessary and hurry on to meet the next customer.

## Pick Floor Man Carefully

This concern has disposed of many second-hand cars by the efforts of the floor man. Many live prospects come from the floor man. But he must be a picked man as he deals with the public. One of the hardest of positions to fill. A floor man soon learns the names and personality of his regular customers and will in a measure cater to their little peculiarities. One man seems to think more of his tires, another of his carbureter, etc. The floor man will discuss these subjects and in turn the customer tells his friend that so and so at a certain garage knows the business. Before long new customers will begin to drive in.

The garage man is a good check on the shop and the manager can often find out the class of work being turned out without being present when car is turned out.

One sees and hears the garages advertising courtesy, guaranteed work, etc., until one must smile. The customer knows that often this advertising means nothing. But why cannot it be made to

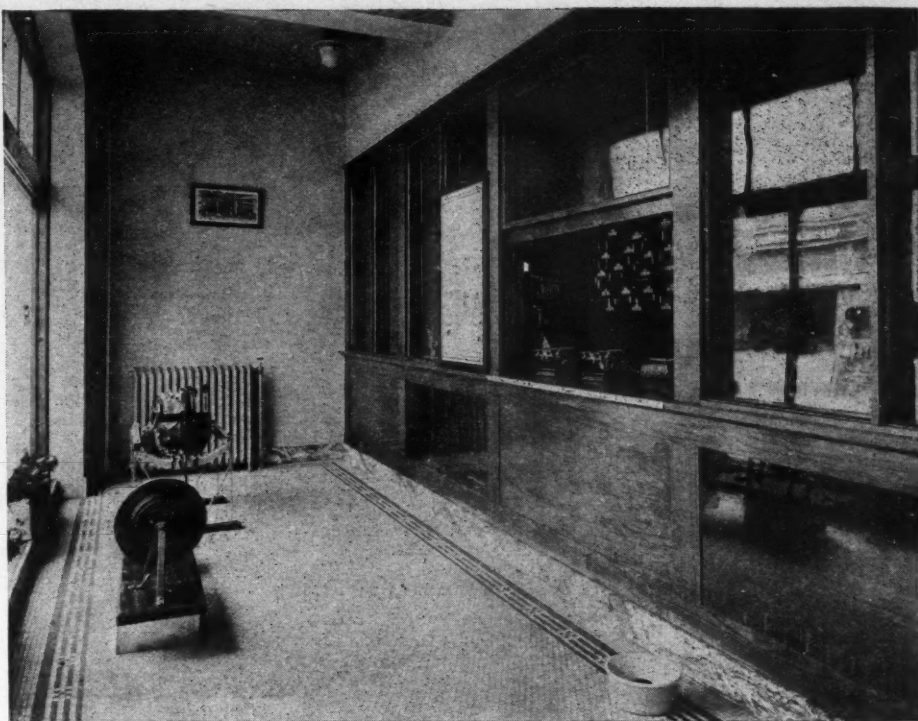


mean just what it says? Look over your place, watch the treatment of your customers. Get on the job and stop those little leaks. Your garage is your reception room. Watch it.

Can a repair shop be made to pay? The X. R. Gill Co. says yes because they have checked it in every particular. Work is done by the job and not by the hour. A customer knows that the cost of labor on a rear axle overhaul will be so much. He is told this amount before he leaves the garage. They are able to give him this cost from data collected in our shop from the amount of time used on previous jobs. The customer is advised that similar jobs have run about so-and-so for material, that it will not vary but a few dollars. When he returns they do not meet the kick: "Did it take all that time to do that job?" "Where did they use all of that material?"

#### Give Owner Repair Order

The repair order is given the customer, receipted, showing the labor charge with material listed on the back of order. The total of labor and material is shown as the grand total. In this manner the customer may check every piece of material used if he should desire. They have the signature of the customer showing this authorization that the work should be done and if other



Window from which repair parts sales are made from the stockroom

**REPAIR ORDER**  
INSTRUCTION CARD

**INVOICE** No. \_\_\_\_\_

DELIVER TO \_\_\_\_\_ No. \_\_\_\_\_

ADDRESS \_\_\_\_\_ PHONE \_\_\_\_\_ DATE \_\_\_\_\_ 19\_\_

CHARGE \_\_\_\_\_ MOTOR NO. \_\_\_\_\_ TYPE \_\_\_\_\_

LICENSE NO. \_\_\_\_\_

INSTRUCTIONS				SALE AMOUNT
2 OVERHAUL MOTOR	28 OVERHAUL CAB	224 TIGHTEN ALL NUTS		
3 OVERHAUL TRANS.	281 CHECK IGNITION	291 OVERHALL STR. GR		
4 C. C. OR ARMS	96 OVERHAUL R. END	311 REP. MUFFLER		
51 NEW RINGS	99 REPLACE R. SPG.	325 CLEAN CARBON		
8 TAKE UP RODS	161 OVERHAUL FRT. AX.	349 OVERHAUL RADI.		
9 REPLACE BANDS	168 REP. SPL. AND ARMS	365 CHANGE HUB		
15 GRIND VALVES	173 REP. FRT. SPR.	368 REP. BRGS. FRT. WH.		
16 CLEAN CARBON	177 REP. RADIUS ROD	470 REP. W. S. GLASS		
17 REPLACE RADI.	226 REP. FRT. CR. MEN	503 REWIRE LIGHTS		

REMARKS \_\_\_\_\_

TOTAL LABOR ONLY \_\_\_\_\_

MATERIAL \_\_\_\_\_

TOTAL AMOUNT \_\_\_\_\_

ABOVE PRICES FOR LABOR ONLY. PARTS EXTRA.

THIS WORK AUTHORIZED BY \_\_\_\_\_

DATE COMPLETED \_\_\_\_\_ 19\_\_

RECEIVED BY \_\_\_\_\_ OWNER \_\_\_\_\_

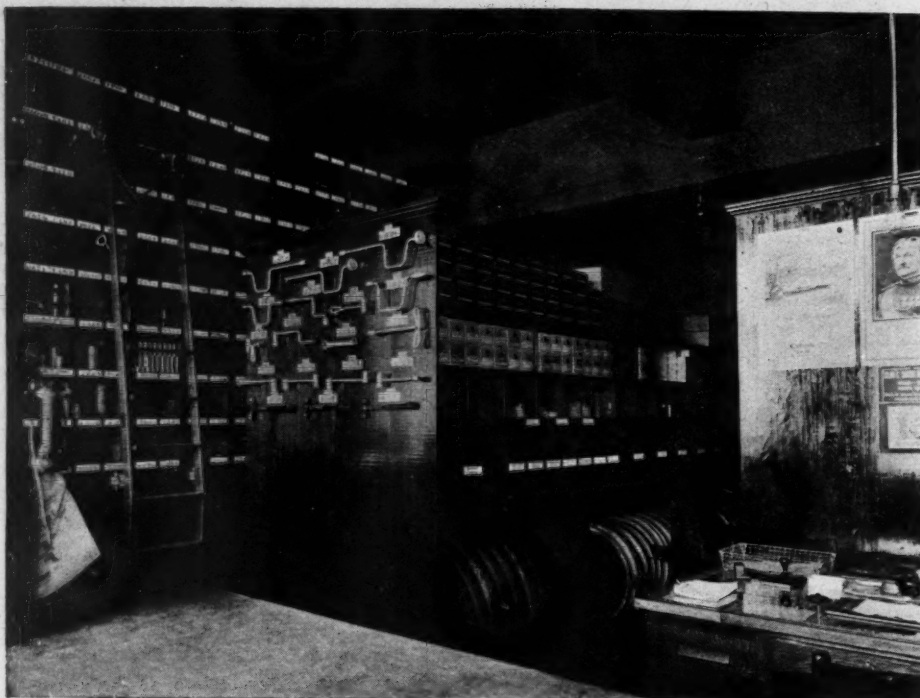
**REPAIR ORDER**  
OFFICE COPY  
(ORIGINAL)

The repair order used by the X. R. Gill Co., Okmulgee, Okla., is made in triplicate. Two copies are sent to the stockroom and one attached to the car and sent to the shop. There is a set labor price for each job and material to be used can usually be estimated by an experienced man

trouble develops they get in touch with the customer and ask to be allowed to do the other operations necessary. However he is informed at the start that they do not want to overhaul his engine if they are not allowed their judgment as to new parts. This eliminates comebacks that are bound to develop on a half-way job. The men are instructed to use only new parts that are absolutely necessary in order to keep the repair bill as low as possible. Customers know this fact and appreciate it. They are the real advertisers of the shop.

#### Men Own Tools They Use

Much money will be spent in tools lost, broken and stolen in a year's time. It has been found better for this company, the employee and the garage to have each man own his tools. He is allowed to put half of his week's salary in tools at one time if he so desires. The mechanic has as much pride in showing his assortment of tools as a customer will a new car. The shop, however, furnishes gages, vises and tools of that nature. They are charged to the foreman and he keeps them in his office checking them out to the men. The shop is equipped with everything that will speed work and make it easier for the men. Overhead track with switches to the running in and burning in stand, engine blocks, steaming vat, etc. The steaming vat is a real advertisement to a shop. It is made of heavy iron with a gas burner underneath. Six cans of lye to fifty gal. of water makes a good solution. However aluminum should not be left in too long. The X. R. Gill Co. says to the customer: "We give your engine a bath as well as an overhaul." In this manner the grit is removed and a wonderful difference made in repair work.



The percentage plan has not proven a success from a standpoint of profit. If the customer knows that a man is getting a per cent on parts used he is inclined to feel that more material than necessary has been used. A good foreman with a good salary will take pride in the showing of his shop and of the work turned out.

#### Record of Parts Used

Every part used on a car is requisitioned from the stockroom by a parts requisition showing the job number and bearing the foreman's signature. Many shops lose money when they keep no record of the parts as they are used and trying to remember at the settlement of the bill. If you must have material that is not in stock, let the stockroom buy it and the shop requisition it. Everything must go on record. It is not "red tape" but business and system. A ten cent item for the shop is not much to-day but there are 365 days in the year's business. Keep a record of all shop expense to the sawdust used. Show it to the men and ask them to cut it down next month. You can make a profit from your shop with system.

Having a separate man for each phase of work is a time saver. He is faster and better satisfied to become expert at one operation at a time. Give him plenty of light, fresh air and a clean place to work and you will be repaid by fast work and contented men that turn out better work. Give him a shower, he is human and deserves the same attention you would ask if you were under his management. Have your get-together meetings, not too often. Have private talks and learn his ideas of your shop and system. The lowest paid man will give you a high-priced idea. Make him think he is appreciated. Give the shop an outing,

and go along yourself. Be one of them. It's no wonder money is lost in the shop with men throwing away material and time, because they do not care. Tell them they are making or losing. If they care, and they will if you give them a chance, they will not let you lose. Of course your shop foreman must know the time allowed for an overhaul, and see that his men keep up the schedule. A foreman must be more than a mechanic, he must be able to handle men and customers; be even tempered and know his business.

A good salary and yearly bonus is the best plan the X. R. Gill Co. has found.

#### REMY TO ADOPT LONGER HOURS

Anderson, Ind., May 24—Officials and employees of the Remy Electric Division of General Motors Corp. have agreed upon a schedule of longer working hours to increase production for the company and better wages for the employees. About 4000 men and women employees entered into the agreement. The new system replaces the two-shift plan alternating between day and night turns on an eight-hour basis. The rotating shift plan, which was an experiment was said to be unsatisfactory to both management and employees.

Under the new system a small night force will be retained for repairs and special work, and employees will have the choice of an hour for luncheon on their own time, or a short period off with pay. Those taking advantage of the latter plan will draw ten hours pay. All of the employees will be off duty after 12:15 on Saturdays.

#### G. M. C. SUBSIDIARY INCREASES

New York, May 25—To permit an increase in its business to a size commensurate with the demands upon it, the General Motors Acceptance Corp. has been authorized to raise its capital and surplus from \$2,500,000 to \$5,000,000. The capital stock now authorized is \$4,000,000 and the surplus will be increased from \$500,000 to \$1,000,000.

The corporation now will have double the facilities for financing the sale of General Motors automobile and other products on the deferred payment system. It is expected this announcement will be welcomed by bankers as it will place additional financing facilities at the disposal of dealers and enable bankers in return to obtain additional collateral gold notes founded upon the obligations of automobile dealers and purchasers. The corporation is now doing a business at the rate of \$150,000,000 a year.



Two views of the stockroom of the X. R. Gill Co. Stock is all systematically arranged, and it can be easily seen when the supply of any part needs replenishment



# The Railroad Difficulty—The Motor Truck— The Automotive Dealer

The Transportation Difficulties of Today Furnish An Opportunity For the Dealer to Demonstrate His Usefulness and To Get a Good Beginning In a Business Which Promises Future Greatness

**W**HEN raw materials cannot be received factories cannot operate. Wherefore, aggressive factories are trucking raw materials hundreds of miles and are keeping their businesses going. Ohio rubber companies are running big fleets of trucks from New England to Ohio, carrying thousands of pounds of fabric.

A certain truck manufacturer is getting his parts in by truck. It is costing him money—big money—but he is keeping his factory going. It takes some of his profits, to be sure, but he has some left. And without this expensive way of getting in his materials he would have no profit at all.

He is an aggressive manufacturer. He is determined to keep going. And it is this type of business man who is going to be in best condition during the months that are immediately ahead of us.

What does all this mean? It is a plain, unmistakable statement to the dealers in the automotive field that they have at their doors an immense market for motor trucks. Necessity has forced aggressive men to use the truck—and, once they have used it, they will be forever sold on it if things are properly handled.

## Get Trucks By Driveaways

There is to-day a truck shortage, of course, and much of it comes from the railroad condition. But if you can get trucks why not drive them from the factories? It can be done and what we need is can-do-it men.

If you haven't a truck agency, get busy and investigate the situation. If you had one and gave it up, analyze yourself and see if maybe you didn't get off on the wrong foot the first time. The truck is not a side-line. It must be handled as a separate business, or a separate department, or at least by a special go-get-'em salesman and a good service man.

All around you are business men who are suffering from the railroad condition. They want to be helped out of their difficulty. The truck can help many of them. And you can cash in by showing them how the truck you sell can do the job.

Above all, don't think the first man to go after is the truck and transfer man. Go after the business men first. The transfer man depends for a living on his truck, and if the truck fails to run for a day he loses a day's income, whereas the business man still has an income even when the truck is laid up for a day.

*Today the railroads are in a mess. There is no need to go at great length into the subject. Any man who has tried to ship anything by rail within recent weeks knows what the result is.*

*The causes are manifold in their ramifications, but the big outstanding fact is that the railroads cannot do the work that exists for them. They are like a one-ton truck trying to move a five-ton load.*

*For one thing, the equipment is run down, and it will take months to get it up to standard, even if the equipping were begun at once and pushed at top speed.*

*For another thing, the railway workers are "run down." Many men have left for other employment, untrained workers have taken their places, the effects of the recent "strike" are still felt, and, even with the present personnel and equipment, there is not a maximum of efficiency.*

*This means that goods are not moving as they should—by rail. Waterways are handicapped through lack of coal and men.*

*The one thing that is saving the situation is the motor truck, and the manufacturers and merchants who are grasping the motor truck as an emergency machine are the ones who are having greatest success and who will continue to be successful.*

That makes the business man a better risk.

And sell for cash if you can. If there are two prospects and one can pay cash and the other can't and you have but one truck to deliver give it to the man who will pay cash for it. And—don't carry this time business yourself. Let the buyer finance it through his bank, or a time payment company, or somebody. But get your money out so you can put it into more trucks and keep it turning over.

The motor truck is the greatest single opportunity that lies before this industry to-day. It will bring big profits in the future to the men who get into the business right, who operate correctly and who stick and make a business of it. To-day there are many dealers who have dropped truck agencies, largely because the truck is unlike the passenger car and requires a different treatment. Some of these men have lacked the vision of the future. Don't be one of them.

In analyzing yourself in your relation to the motor truck—even if you have

handled trucks for years—look carefully into your service system. The motor truck is only so much transportation to the man who buys it, and if it doesn't run it isn't worth a cent except as junk. The passenger car can be laid up for a spell without much harm being done, as a general rule, for the individual can use street cars or taxicabs and get by, but the truck must run every day in the week and give a maximum of service.

To keep these trucks going you must have an efficient service system. Have you considered the unit repair system? Under this system a complete part, such as an axle or engine, is taken out and a complete unit put in. While the damaged part is being repaired the truck runs with a minimum of lost time. Sometimes the repaired part goes back into stock, and sometimes it is put back where it belongs. If both parts are in good condition it makes little difference, because the owner cares little what the engine is so long as it does the work.

You should study methods for getting trucks out of your shop in best condition in a minimum of time. You should organize the whole service station or shop on a basis of maximum operating service for the truck owner. This kind of service can do more to build a truck business than any other thing you can do. You can build a sales system, but without service the sales will fall flat.

## Trucks Essential to Production

And all the time you are doing this, bear in mind that you are a transportation merchant rather than a dealer, no matter whether you sell cars or trucks or both. Once more we see looming on the horizon the governmental tendency to class the automobile as a luxury and a non-essential. We must prepare again, through our own effort, through the effort of the N. A. D. A. and every other agency, to combat this unjust classification.

The truck business has the advantage of not having to combat any luxury classification. Its essentiality is recognized, even by the bankers who want to restrict motor car loans. There is no obstacle in the way of the motor truck except the difficulty in getting materials to the factories—and the truck is itself solving that difficulty to a large extent and will do so to a still greater extent.

There is one other way in which the dealer can make himself a factor in the situation to-day in his home town. That

(Concluded on page 39)



# EDITORIAL



## Applying Common Selling Rules

drives his father's car down to have a cut-out installed to the precise woman who is much wrought up because of a fender that has a one-half inch scratch upon it.

It takes a mighty good salesman to sell the public, especially when the product is automobile service. But the problem is not so complex if those in the service station, principally the service salesman or manager observes the fundamental principles that apply to selling any product, automobile service or a suit of clothes.

We have only to look about us to see how other commodities are sold and apply the common rules to selling service. We know our likes and dislikes. We do not like to go into a dirty store, nor do we like to be waited upon by uncivil clerks. But, we do like to go into a restaurant with a party of friends and have the head waiter treat us as though it were a privilege for him to give us individual attention, even though he does it with all his customers. He is selling service. He may not know a thing about how the chef cooks our food, all he is interested in is to see that we get what we want and that the house gets paid for what we eat.

We can apply the same thing to the automobile service station. The service manager or salesman need not know how a certain repair is going to be made in the shop. His job is to see that customer Jones gets his wants satisfactorily attended to and that the house gets the money for the job.



## Now Is the Time to Sell Trucks

his usefulness and to get started quickly in a business bound to become great in the future.

There is a decided advantage to the truck business in that it does not have to combat any luxury classification. Its essentiality is recognized even by the bankers who want to restrict motor car loans. About the only difficulty in the way of the truck business is the inability to get parts, but even in this the truck itself is solving the problem to a large extent and will do so even more as time goes on.

No dealer should make the mistake of looking at the truck business as a side line. It must be handled as a separate business or a separate department. It must be handled by live salesmen and the right kind of service men. The first man to sell is not the truck and transfer man. All around are business men suffering from the railroad condition. They need help. The motor truck can help many of them and the job of the dealer is to show these business men how to do it. Necessity has forced aggressive men to use the truck, and

once they have used it, they will forever be sold on it if things are handled right.

Labor is in a restless state; the railroads are in bad shape; Europe is having her problems; many things are wrong; but there is a big opportunity for the men in the motor transportation business.



## Lessons From Racing

**P**HYSICIANS travel thousands of miles to attend clinics—held by the Mayo brothers at Rochester, Minn., and other noted surgeons in the far parts of the world. They sacrifice time and money because in this way they may learn more about

their profession; that they may improve themselves and make themselves better physicians. Members of other professions make similar sacrifices to improve themselves.

Down at Indianapolis Monday will be the annual clinic of the motor car industry—the 500-mile race. At that clinic will be shown the latest ideas and developments in motor car designing and construction. And these new ideas and new constructions will be dissected and analyzed by the sternest clinic the motoring industry has to offer, 500 miles of racking, grinding demonstration at top speed, over a course which is no whit better in smoothness than the commercial passenger cars founded upon their principles later will have to be driven over.

Racing has gone beyond a sport. If it were only a sport, there would be mighty few men vitally interested in the automotive industry who could find time to attend the race. The average automobile engineer, designer, executive, is much too busy these days to take three or four days or a week from his business just to indulge in a sport. Men of this sort go to Indianapolis because they expect to learn something there which will benefit them in their business, and in their profession.

Perhaps the service man may say:

"That's all very well for engineers and manufacturers and big dealers. But how is a race going to benefit me? It certainly won't teach me anything in servicing cars, and it would be absurd to say that the wasteful methods of pit repairs can teach me anything in my particular business."

That is one of those half truths which are so dangerous. To recommend that pit repair methods be followed by service men would be ridiculous. But there still is plenty for even the service man to learn at the race. Those very pit repairs can teach him something, for they will teach him the value, the absolute necessity of team work in repairs. As the pit crews keep the racing cars on the track, just so will teamwork in the service shop keep your business on the track in case of trouble.

You can't learn too much about your business or your profession. Perhaps you can't see any direct benefits from racing, but it will teach you a little bit more about your business. Some of the things you see you may not be able to understand, but *MOTOR AGE* will explain them in its June 10 issue, in which, particularly the service side of the big race will be told to you.



## To the Memory of C. H. Gurnett

Who for seventeen years contributed to the growth of the *Class Journal* publications, the automotive industry and the advertising profession.

Swiftly the world moves and soon are they forgotten who serve valiantly in their day—and then pass on.

Too soon from daily thought pass the deeds done by able men, too quickly does the mist become impenetrable over the faces of those who help to make our world a better place for all of us.

To the memory of C. H. Gurnett we wish to pay our tribute—the little we now can do for one whose character and work rendered him dear to thousands, who share with us the sorrow of his passing.

One aim in life—to do well that thing which he did, whatsoever it might be, greater than which cannot be said of any man.

Integrity was personified in him in full degree. Thoroughness at all times characterized his daily life and work.

Believing in himself and his work, he possessed himself of the fullest measure of knowledge of his craft, and to essential detail gave that attention which eliminates the detail and leaves the observer with a conception of only a pleasing and fully consummated masterpiece of clean result.

No business man who dealt with him but remembers well all these things.

In the hurry of the modern world, when temptation often leads to short but doubtful paths of haste, he built soundly and solidly, traveled rapidly but surely, and left in every place a friend.

A multitude will miss him as it misses always the player who plays the game by the rigid rules of real men.

The words we can use are so inadequate—but the twinging heart-strings will long reberberate in memory.

# Nation Celebrates "Ship-By-Truck" Week

"SHIP-BY-TRUCK Week" came in for a general observance throughout the United States last week, tours and parades of more or less pretentiousness being held in virtually every locality. In most places, the truck dealers were at the head of the ship-by-truck demonstrations but in others they were aided by local authorities and the recently born truck express companies. For most part the ship-by-truck celebrations took the form of demonstrations, in most cases a direct appeal being made to the rural communities.

The vast possibilities of the truck have apparently come to the fore more during the last winter than any previous time, which accounts for the widespread interest in Ship-By-Truck Week this year. The coal, steel and railroad strikes of the last winter brought home forcibly the necessity of building up some sort of transportation service to supplement the present inadequate railroad service and the lessons taught by those strikes apparently have been well learned.

## Detroit Holds Parade

Detroit, May 17—Headed by the Great Lakes Naval Training Station band, the truck parade inaugurating the Ship-By-Truck and Good Roads Week left Detroit at 8 o'clock this morning for a four-day tour through the southern and central part of Michigan. F. W. Fenn, secretary of the motor truck committee of the National Automobile Chamber of Commerce; Austin F. Bement, secretary of the Lincoln Highway association and Capt. W. S. Gilbreath, secretary of the Detroit Automobile club, accompanied the boosters and will deliver addresses at the towns along the route.

Sixteen makes of trucks were represented and a number of Good Road boosters accompanied the party in passenger cars. The first night stop will be at Flint to-night, where a mass meeting has been arranged. To-morrow night the tourists will stop in Ann Arbor, and the Wednesday night stop will be in Adrian. Ship-by-Truck enthusiasts in all of the towns to be visited have signified their intention of joining the party, and the banquet in Detroit Thursday night is expected to attract more than 100 persons.

Reports from the farmers along the route indicate that the Good Roads and Ship-by-Truck propaganda has had its effect, and the party was assured of an enthusiastic reception all along the road. At the banquet Thursday H. S. Firestone, president of the Firestone Tire & Rubber Co., Governor Sleeper of Michigan, Mayor James Couzens and E. N. Hines, president of the Detroit Automobile club, will be present. P. T. Cosgrove, president of the Michigan Good Roads association will join the tour and deliver several speeches at towns en route.

Trucks represented on the tour are the Acme, Bethlehem, Chevrolet, Clydesdale, Columbia, Diamond T., Transport, F. W.

D., Indiana, International, Nash, Packard, Paige, Reo, Reynolds and Wolverine.

## School Children Interested

New York, May 15—A novel preliminary to the national ship-by-truck and good roads week was held to-day in New York, 5000 high school students assembled in the Capitol theatre, the largest in the world, and listened to talks on ship-by-truck and good roads. Two \$50 prizes were awarded for the best 500 word essays on good roads written by pupils of New York high schools. The meeting was concluded by motion pictures showing the advantages of the truck for short hauls and the necessity for good roads.

Francis M. Hugo, secretary of state of New York, predicted that, on the basis of present registration figures, there would be 1,000,000 automobiles in New York state within four years.

## Philadelphia Has Tour

Philadelphia, May 18—At 7 o'clock Monday morning, starting from Broad and Callowhill streets, in front of the quarters of the Philadelphia Automobile Trade association, the caravan of fifteen entrants—fourteen motor trucks, three trailers and one tractor—representing Philadelphia's demonstration in the National Ship-by-Truck-Good Roads Week, got away for its farm land tour, led by a pilot car, a tour directors' automobile and two press cars.

Every vehicle displayed an American flag and the city emblem in blue and yellow, besides an official number of its appearance in the parade.

The route in Philadelphia was down Broad street to Market, around City Hall, continuing on Market to Twenty-first, to Walnut, to Thirty-third, to Woodland avenue, and thence to Darby—the first hint of the countryside. A police escort on motorcycles accompanied the caravan to the city limits, when its place was taken by an escort of the Darby police.

The tour was under the management of Albert S. Oswald, tour director; A. W. Sutherland, assistant tour director, and H. M. Gallagher, purser.

## Twenty in Texas Tour

Dallas, Texas, May 9—Under the direction of Charles L. McNulty, tour master, a caravan of twenty trucks late last night completed a six-day tour of North Texas for the purpose of demonstrating the value of trucks to farmers of the district and to encourage the building of good roads. The tour, which was declared to have been a success in every respect, had the official sanction of the American Automobile association, which was represented on the trip by Royal A. Ferris, Jr.

The following Texas towns were included in the tour: Richardson, Plano, McKinney, Van Alstyne, Sherman, Denison, Whirewright, Bonham, Honey Grove, Ladonia, Wolfe City, Celeste, Greenville,

Cash, Quinlan, Terrell, Wills Point, Canton, Mabank, Kemp, Kaufman, Forney, Crandall and Seagoville.

The trucks left early on the morning on May 3 and covered 402 miles through all kinds of roads before returning to Dallas. Drenching rains on three successive nights put the roads in the worst condition in which they had been for years, but this, if anything, only added to the success of the tour.

"The tour proved all that it had been sent out for and more," said M. Boyd Keith, general chairman of the tour. "The farmers who saw the caravan know that trucks can go anywhere, that they can carry the loads and that they can be used in farming with profit."

## Louisville Shows Movies

Louisville, May 22—Accompanied by a band, the train consisting of fifty motor trucks entered by Louisville automotive dealers, left this city Monday morning for a tour through six counties. The first noon stop was at Vine Grove. During the first night the trucks were parked in the public square at Elizabethtown, where all of them were illuminated, as the truck train carries its own lighting system. Whenever the cars were parked at night a string of electric lights illuminated the vehicles. The evening program also included a band concert, followed by a dance, the entertainments being free.

Tuesday morning the motor train left for Hodgenville, where a stop was made for dinner and the run to Buffalo was made by way of the Lincoln Farm Road, returning through Hodgenville. The route to Bardstown was through Ather-tonville and New Haven. The run Wednesday led through Springfield and Bloomfield to Taylorsville, the final "jam-boree" being held there. The last day of the tour led the train through Fisherville and Jeffersonton and on into Louisville.

A movie film entitled "Ship-by-Truck" was shown at towns along the route.

## \$135,000 Value of Hoosier Display

Indianapolis, May 17—The \$135,000 caravan of motor trucks under direction of the truck dealers' division of the Indianapolis Auto Trade association left this morning on its educational tour of eastern Indiana. The trip will be made especially to impress the farmers with the fact that the motor truck is an economical machine for farm transportation. Demonstrations will be made to show that the pneumatic tired truck will work as satisfactorily in the fields as on the roads.

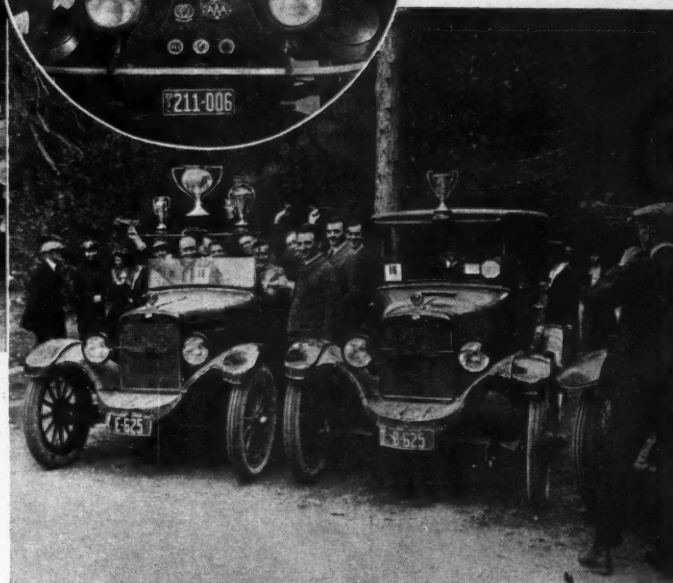
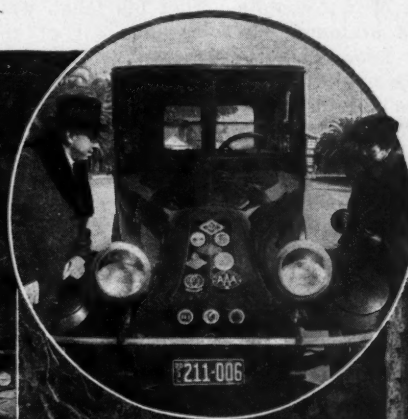
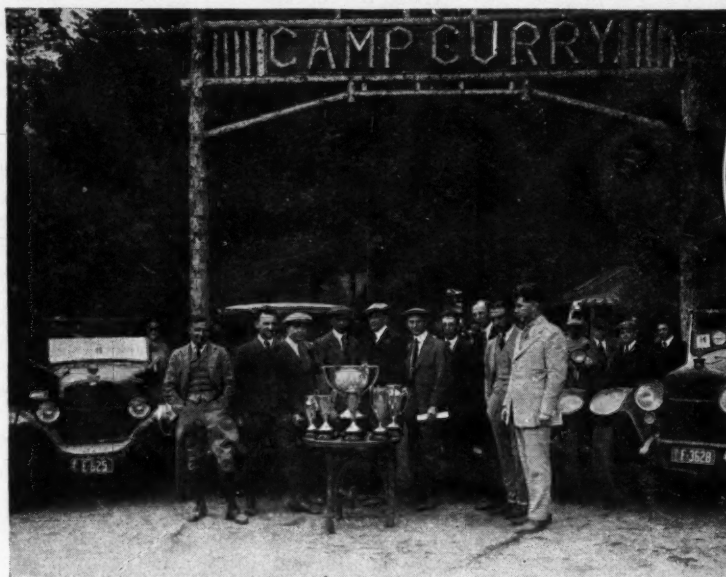
The trade association has arranged this demonstration in connection with the national ship-by-truck good roads week, May 17-22, which has the support of the great national associations, vitally connected with transportation, in their movement for better roads, which will permit the use of trucks for long and short hauls.

(Continued on page 61)



# Overlands Win in Yosemite Economy Run

Templar and Dorris Also Victors in Their Classes  
in Unique Tests—Three of Winners Four-cylinder Cars



In circle—The most decorated privately owned car in America. It carries the emblems of eleven motor clubs besides its license plate. It belongs to J. L. Smith of Kalamazoo, Mich., who arrived in California recently.

Two views of the cars and trophies in Yosemite economy run

**L**OS ANGELES, May 22—After three years of striving to exceed 50 ton miles to the gallon of gasoline in the Los Angeles-Yosemite Valley economy run success crowned the efforts of four cars that competed this year. An Overland touring car won first honors in Class 1, a sedan of the same make was first in Class 2, a Templar won in Class 3 and a Dorris in Class 4. Three of the four winners were four-cylinder cars. In addition to leading in its class the Overland touring car won the special sweepstakes award for the best showing regardless of class.

The annual contest was held under the auspices of Camp Curry, Yosemite Valley and entries were limited to cars represented by Los Angeles dealers. Two dealers annexed all the glory as the Dorris and Templar are both represented by the same distributor and the Overlands took double honors. A Willys-Knight was second in Class 2 so that the local Overland branch is wildly enthusiastic.

Of the eighteen cars that entered, all but three completed the run. The Comet

## Result of Yosemite Economy Run

Class	Car	Weight	Gas Gals.	Oil Pts.	Water Qts.	Ton Miles	Percentage
1-E	Overland (Tour)	3460	10 1/4	5	6 1/2	60.74	52.64
1-E	Briscoe	3380	11 3/4	2 1/2	1	51.13	48.57
1-E	Dort	3270	13 3/4	2 1/2	3 1/2	43.45	40.31
2-E	Overland (Sedan)	3730	12 3/4	9	8 1/4	51.41	48.77
2-E	Willys-Knight	4660	16 3/4	2	1	50.57	48.05
2-E	Stephens	4220	20 3/4	1	4	43.17	41.44
2-E	Commonwealth	3440	17 3/4	1 1/2	10	34.20	30.56
2-E	Crow-Elkhart	3460	16 1/4	3	22	38.14	29.45
2-E	Metz	3790	20 3/4	8	8	32.45	26.68
2-E	Skelton	out					
2-E	Comet	out					
3-E	Templar	3350	12	2	2	49.20	46.70
3-E	King	4350	17 1/4	8 1/2	3 1/2	45.15	39.13
3-E	Cole	4790	21 1/4	3	1	40.40	38.83
3-E	Holmes	out					
4-E	Dorris	4960	18 1/4	2	1/4	47.64	46.48
4-E	Premier	5500	23 3/4	1	19	41.82	37.32
4-E	National	4520	23 1/4		3/4	34.14	34.04

Total distance (official) 355 1/2 miles. Ton mileage figures arrived at by following formula—weight of car times miles, divided by 2000, equals ton mileage. Divide result by gas consumption in gallons for ton mileage per gallon. Deduction made in points for each quarter fraction thereof of water used, and also for pints of oil.

had mechanical trouble early and withdrew. The Skelton was wrecked by a collision on the Ridge road. Ignition trouble was assigned as the reason for the Holmes not reaching the final control within the limit and being disqualified. When only thirty miles out of Los An-

geles, two of the wire wheels on the Premier collapsed. A hurry-up call was sent to the agency and new wheels were put on in time for the car to keep within the time limits.

The official distance of the run was 355 1/2 miles. Two days were devoted to the contest, the first night control being at Fresno, 210 miles from the starting point. In making the trip the cars had paved roads over which to travel between Los Angeles and Madera with the exception of a few miles. One of the detours was through Tejon canyon and here the going was very bad. This year's event was earlier in the year than any of its predecessors and for this reason the weather was much cooler and the cars benefited accordingly.

Within two hours from the time the cars left Los Angeles, they were on the famous Ridge

Road which tops the Tehachapi mountains and there are some 1100 curves within a distance of twenty miles. Occupants of the cars had to submit to some discomforts near Chiniquin where the elevation is more than 6000 feet, because of the cold wind.

## Gov. Sleeper Refuses to Meet Motor Workers in Wage Talk

**D**ETROIT, May 23—Gov. A. E. Sleeper, who roused the ire of automobile employees in a prepared statement in which he urged wage revision, has declined the invitation of the employees to attend a meeting of automobile workers in this city to-night. The meeting was called for a general discussion of conditions particularly with reference to the recommendations of Gov. Sleeper. The governor in his statement last week urged that a readjustment of wages was the real solution to the high cost of living problem. He said such revision would do more to readjust conditions in Detroit and other industrial centers than all of the acts the legislature could pass.

Declaring he was not in favor of low wages, but basing his argument on a special inquiry, the governor declared he was sincere in his conviction that wage adjustment alone would bring the desired relief.

The governor cited instances where boys from 18 to 20 years old are making from \$7 to \$11 a day, and urged instead of paying these wages to boys who contract expensive habits, men with families should be given preference. He said few of these young men have any bank accounts, despite their high wages, and declared they are spending their money more or less foolishly from pay-day to pay-day.

Conditions in Detroit, the governor said, are abnormal and any benefits accruing to Detroit by legislative action, he said, would be of little benefit in other parts of the state, where no comparison could be drawn with Detroit. Reduction of wages, he said, would permit the manufacturer to reduce the cost of his product and that in the end would mean a reduction to the consumer.

Lack of production of food stuffs, the governor said, was due to the wages in Detroit and industrial centers that are enticing the young men and boys from the farms. He cited several instances of men with large families of boys and

girls, the father too old to properly conduct his farm, which was going to ruin because all of the children had been drawn to Detroit by the high wages offered.

"These boys and men will wake up some day and go hungry unless there is some of Michigan's manhood left to run the farms," said Governor Sleeper. "Statistics show there are approximately 1,750,000 acres of idle farm land in Michigan and more will be idle unless the farmer can keep his own sons, or get other help in producing crops. The men on the farms are from 50 to 70 years old. They cannot work the farms successfully, and the price of farm products will remain high until there is a revision of wages that will put an end to the farm boy leaving home to get hold of some of the easy money in the industrial centers."

### PLAYING FOR WOMEN'S TRADE

Fort Wayne, Ind., May 22—The Fort Wayne Tire Service, which has just been opened, and which will handle the Wayne tires and tubes manufactured in this city, has attractively fitted a room to appeal to women customers as the concern believes that there are enough women motorists to make worth while this innovation in local tire sales concerns. The room has been equipped with comfortable reed furniture, monogrammed curtains, rugs on the floor all in harmonizing shades of brown and shaded lights on the walls. A counter and low shelves arranged before a flower-covered trellis is the only sign that the place is

a tire and tube sales room instead of a woman's room in a hotel or a woman's room in an up-to-date club house.

All the tire repair work, for which the service station is fully equipped, will be taken care of in the rear of the building. The location of the service station, just diagonally across from the Anthony hotel—together with the fact that the front of the building is entirely white, makes it very easy to find and easily identifies it for tourists.

The service station is in charge of J. Chester Law.

### FORD BLAST FOUNDRY OPENS

Detroit, May 20—The first of five Ford blast furnaces at River Rouge, which eventually will manufacture all the pig iron used by the Ford Motor Co., was started this week. Henry Ford II, three year old grandson of the manufacturer, touched the match which started the first blaze. A second furnace will start within thirty days, and as rapidly as construction will permit, the other three will be put into operation.

The furnaces will turn out 100 tons each of iron every twenty-four hours, and a large foundry will be built in connection to handle the molten iron which will be poured directly into molds of automobile and tractor parts. Millions of cubic feet of gas will be produced daily by the furnaces and will be used in the plant operation.

### HUNN NEW HARE SERVICE CHIEF

New York, May 23—E. Hunn, Jr., formerly service manager of the Packard Motor Car Co.'s service station in Long Island City, has been made service manager of Hare's Motors Co., of New England in Boston. Hunn is well known in New York trade circles and was a member of the board of directors of the Automotive Service association of New York.

## Cincinnati's Striking Mechanics Put Firms on "Unfair" List

**C**INCINNATI, O., May 23—Twenty-six Cincinnati garages and two truck manufacturing plants have been placed on the "unfair" list of union labor as a result of labor difficulties which have culminated in a strike of 700 motor mechanics in this city.

Two truck manufacturing plants and some of the largest garages are affected by the strike, which was called when garagemen opposed the attempts of the mechanics to put through a new wage scale. The strike has been ordered, although pickets have been stationed around most of the garages. Some of these pickets were withdrawn this week, but the end of the strike is not in sight.

Four truck and automobile manufacturers announced this week that they will reopen on or before July 1 with a full force in all departments. They have been affected both by the strike of mechanics and an almost general strike of machinists, and will reopen on a platform of principles which includes denial

of the right of "radical agitators, walking delegates or so-called labor leaders" to interfere with the management or operation of their plants and an offer of protection to men and women "in the lawful exercise of his or her right to work where they please." Wages will be based on individual ability, it is announced.

The automobile manufacturers are the only manufacturers to make a public statement along these lines, although more than eighty manufacturers in various lines are tied up by the machinists strike, which began three weeks ago.

### BALK AT G. M. C. INSURANCE PLAN

Binghamton, N. Y., May 25—Representatives of the General Motors Corp., who are seeking to interest dealers in General Motors products in the central and southern New York territory in the company's automobile insurance plan, are meeting with considerable resistance on the part of dealers. A number of mer-

### ARIZONA ROAD CONTRACTS LET

Phoenix, Ariz., May 22—More than one year after the Good Roads bond issue of \$4,000,000 was voted by the people of Maricopa county, contracts have been finally signed with Twohy Bros., of Spokane, Wash., and work will begin as soon as the equipment can be gotten together.

For months it looked as if bitulithic would be the type of roads but public sentiment was so strong in favor of concrete that Twohy was awarded the contract for this type of construction. The contract calls for 278 miles of concrete highways to be completed within two years. This is said to be one of the largest complete unit jobs for road work so far contracted in the United States.



chandisers of General Motors products, principally cars, have refused point-blank to consider the insurance plan. They insist that they cannot, in justice to their own business, withdraw their insurance patronage from local insurance men, who in turn are often liberal patrons of their establishment. Regardless of the merits of the General Motors plan, the dealers who object to it feel that they must stand by the local insurance man to retain his trade and the trade of friends and acquaintances he influences in cars, trucks, tractors, tires, automotive equipment and service work.

Several dealers in a considerable group of counties, east, north and west, of this point, report lengthy arguments with General Motors field men, all with the same result, the field men departing insisting that the dealer take on the insurance plan and the dealer standing by his right to favor local business interests which favor him.

#### DRIVEWAYS QUADRUPLE SHIPMENTS

New York, May 21—Figures for the month of April received by the National Automobile Chamber of Commerce show that in that month the factories of the country shipped 12,674 carloads of automobiles by rail and drove away 51,599. This compares with 23,860 carloads shipped in March and 49,778 driven away. It offers a speaking commentary on the inadequacy of the railroad transportation provided the industry.

#### POSTOFFICE GETS SERVICE MEN

Memphis, Tenn., May 25—Sixteen chauffeurs, four mechanics and two garagemen will be used in starting the new postoffice garage at Memphis to be ready for occupancy by June 1. The force will be augmented with growth of service.

## Duesenberg Incorporates to Make Cars in Indianapolis

INDIANAPOLIS, Ind., May 25—The Duesenberg Automobile Motors Co., Inc., incorporated under the laws of Delaware with a capitalization of \$5,000,000, to manufacture passenger cars and engines, has bought a site of 15½ acres at Washington and Harding streets here.

The company, according to the announcement of Myron R. Green, secretary of the industrial bureau of the Indianapolis Chamber of Commerce, will manufacture a high grade motor car to sell for \$6000 or more, the product of the inventive genius of Fred S. Duesenberg. Production plans call for 2400 cars the first year.

The car will be equipped with a Duesenberg designed engine, eight cylinders in a row, capable of a speed of from three to ninety-five miles an hour. The car will be equipped with a four-wheel brake, also an axle of Mr. Duesenberg's design. The engineering claim is made that the car will be 400 pounds lighter than any other car approaching its

## Take Steps to Standardize Motor Industry in South

MACON, Ga., May 27—Georgia's motor truck industry is to be standardized. The first steps to bring this about were taken at a meeting of motor truck owners from all parts of the state here the past week, at which time the Georgia Motor Truck Owners' Protective association was formed.

W. E. Greene, of the Macon Motor Express company, was elected president; Gilham Morrow, of Atlanta, vice-president; John W. Callaway, of Macon, treasurer, and B. Gilham of Macon, secretary.

Secretary Gilham states the objects of the association in these words: "To work as a unit for a reasonable license tax on motor trucks; to oppose any unjust and oppressive traffic rules and regulations; to give all possible assistance to better roads and safer bridges; to gather and disseminate statistics and information pertaining to motor truck operation; to co-operate toward building up a great highway motor express service throughout the state, and to advocate uniform and just rates for service.

In this connection there are several motor express routes in operation out of Macon, which have proved entirely satisfactory. Shipments to points thirty, forty and fifty miles away, are made with greater speed than by train. Deliveries are made at the very door of the consignee on the day of shipment, while by train deliveries are made the following day, the consignee being forced to make his delivery from a railroad station.

To carry out the program of the association Secretary Gilham was instructed to prepare a schedule of rates and traffic regulations for recommendation to

the Georgia Railroad Commission, placing the motor express on the same basis as the railroads.

Resolutions also were drawn appealing to the Georgia Representatives in Congress for their support of highway improvement measures. Considering that the present motor truck license tax in Georgia is excessive, the association requested the president to appoint a committee to acquaint lawmakers with their attitude toward the tax on trucks in public service, particularly those used by motor truck express lines.

Directors for the association were elected as follows: M. E. Elliott, Macon; Leo P. Baum, Dublin; J. T. Dixon, Thomasville; C. W. Bailey, Rome; Ben Van Dalsom, Moultrie; R. H. McComb, Milledgeville; J. VanDyke, Brunswick; W. W. Martin, Fitzgerald, and T. F. Cathcart, Atlanta.

#### GETS GOVERNMENT STEEL

Lansing, Mich., May 22—Ernest Dail, general manager of the Dail Steel Products Co., closed a deal recently for 800,000 tons of government steel for his factory. The steel which was destined to be made into Eagle boats at the Ford plant was placed on the market by the government some time ago, and Dail took advantage of the opportunity to purchase it. The steel was fabricated in the mills and shipped to the Eagle plant during the war with holes drilled ready for assembling. The Dail company, however, will shear the steel so that little waste will result on account of the holes. Dail executives declare the steel arrives at a time when the shortage gave rise to fear that the plant would have to cut production materially until the steel mills had returned to normal production.

#### NEW MOTOR CLUB IN NEW ORLEANS

New Orleans, May 20—The Louisiana Motor club has been formed here as a co-operative combination to aid motorists in obtaining expert repair service. J. Raynaud, former vice-president and general manager of the Marine Paint and Varnish Co., is at the head of the new club. A building with 40,000 sq. ft. of floor space, is to be erected, where competent mechanics will do repair work for the members at somewhat less than current rates charged by private repair and service stations.

#### SERVICE MEN PLAN CAMPAIGN

New York, May 27—Members of the New York Service Manager's association were guests this week at the service station of the Autocar company branch here. The association is now planning a campaign for a 500 membership. Plans for joint outings with the Newark and Brooklyn service associations also are under way.

#### ADOPT DENVER TRAFFIC PLAN

Columbus, Ohio, May 26—Twenty policemen in automobiles donated by the Columbus Automobile club started the Denver system of traffic rules enforcement in Columbus recently. During the first night they tagged 254 automobiles and the owners were asked to attend "school" at police headquarters the following day. The "school" was conducted by Safety Director J. P. McCune, Chief of Police French and Judge Siedel, of the police court.

## See a Curtailment of 35 Per Cent In Car Production

**Manufacturers Declare That This  
Will Be Necessary Because of  
Present Economic Conditions**

NEW YORK, May 24—Curtailment of approximately 35 per cent in the scheduled production of passenger automobiles will be necessary because of the present economic conditions, it is estimated by manufacturers. They are willing to co-operate to this extent to bring about the deflation of currency and prices necessary to restore conditions more nearly normal.

Financial and transportation difficulties have made necessary readjustment of production programs. In the first place it is impossible to get to the factories the supplies necessary to operate as extensively as proposed earlier in the year. In the second place, the decision of the Federal Reserve Board to hold down credits will militate against them.

Bankers feel that too many passenger automobiles are being bought on credit and they contend that many persons buying cars cannot actually afford them. They also assert that a considerable percentage of the cars in use are non-essential. Upon this argument they base their decision to curtail automobile credits. The manufacturers do not agree that passenger cars are any less essential than telephones or typewriters, but they are not disposed to assume a pugnacious attitude. They realize that drastic measures are necessary to put the country on a sound, economic basis, and are glad to lend their aid.

Credit will be supplied to finance completion of cars now under construction.

### Trucks Classed as Essential

The transportation crisis is more serious than the credit stringency. Operation of the roads has been taken over by the Interstate Commerce Commission to all intents and purposes. Every effort is being made to untangle the jam of freight but it probably will be weeks before it can be accomplished. While the commission may not promulgate a formal priority order for freight shipments, the result of its efforts will be the same. Food and fuel will be moved first. Trucks and tractors will be placed well up on the list of essential manufactured products and passenger cars will head the list of non-essentials.

The railroads and every other element in industry are seizing eagerly upon motor trucks as the transportation salvation of the country. Truck manufacturers will be given every aid possible to exceed their production schedules. It seems probable that the men who will be laid off in the passenger car plants because of the cut in production will be absorbed in the truck factories.

Men in the automotive industry are prepared to prove that automobiles are

transportation. They are now trucking in most of the supplies they are using and are ready to go to almost any extreme to increase efficiency in this respect. Regardless of obstacles they will keep their factories going. Costs of manufacture will be greatly increased by the use of trucks for hauling materials long distances, but they are willing to sacrifice a share of the profits.

The War Department and the Council of National Defense have outlined plans for the mobilization of trucks all over the country to help the railroads and the army will distribute for this purpose the thousands of trucks it owns, but is not using. Tractors and other machinery will be used to keep the roads in repair while they are under such a heavy strain.

Dealers as well as manufacturers must expect to forfeit part of their profits on passenger cars, but they can expect a bigger truck business than ever before. Economists, financiers and far-sighted business men are agreed there is no occasion for alarm if the men who make up the financial fabric of the nation keep their heads and face the future with calm confidence.

With the prices of commodities falling all over the country, it is encouraging to note that there has been no slashing in automobile prices. The National Automobile Dealers association has been able to find no authenticated instance where this has been done.

### FORM NEW HIGHWAY BODY

Madison, Neb., May 22—Delegates from twenty towns have perfected an organization for a new east and west highway across the state to be known as the Upland Highway, with the object of shortening the route of the transcontinental tourist across the state. Leaving Lincoln Highway at Dunlap, Iowa, the new route passing through Onawa into Nebraska at Decatur, then through Madison, Ord, Sargent, Stapleton and Scottsbluff. This new route cuts off the big bend in the Lincoln Highway caused by the Platte river and takes the tourist over the uplands of the state instead of the lowlands.

### PROTEST CANADIAN PARTS LAW

Saskatoon, Sask., May 24—Interested principally in the New Auto Repairs Bill, which comes into effect in Saskatchewan May 1, the motor car and accessories dealers of Saskatoon met in the offices of the local Retail Merchants' association and discussed how and where the new act affects them.

The decision arrived at was that in its present form it discriminated against the retail dealer in that it required him to carry a complete stock of repairs for all cars he sold for a period of five years from the date of sale.

It was generally felt that the manufacturer or manufacturers' distributor should be responsible for the repairs being readily obtainable, and a delegation was recommended to meet in Regina.

## "Keep Going Despite All" Is Cry of Car Makers

**Herculean Efforts Being Made to  
Keep Wheels Turning in  
Face of Obstacles**

NEW YORK, May 26—Dispatches to MOTOR AGE from its correspondents in the automobile centers of the country, disclose that manufacturers are making Herculean efforts to keep their plants in operation in spite of the collapse of the railroads. Conditions are much better than might have been expected in view of the obstacles which must be faced.

All plants are in operation. In cases where production has been out because of the shortage of supplies, not more than 10 per cent of the employees have been laid off. This is true especially in the Detroit district. From some other cities come reports that factories are operating, fully manned.

These gratifying conditions are due almost wholly to the intensive use of motor trucks. They have been the salvation of the industry at a time when the railroads could be depended upon for nothing. They are making regular trips over long distances and are standing up splendidly under the heavy strain imposed upon them. They have demonstrated that the time will come when the automotive industry can be independent of the railroads for short haul business, and that it can stand upon its own feet entirely if an emergency arises.

Executives of automobile factories are displaying a dogged determination to keep going in spite of everything. They positively refuse to be discouraged and are maintaining splendidly the morals of their organizations. They are disregarding the extra manufacturing costs and the motto over their desks is "business as usual." They never have fallen down in an emergency and they are skilled in meeting problems. They are not tied up in the red tape of tradition. They are resourceful and determined.

These manufacturers are determined not to quit. They have settled down to a grim determination to prove to the country that automobiles are not luxuries or even non-essentials, but that they are transportation and that without them the wheels of industry would be halted most effectively by the collapse of rail transportation. To do this they are curing their own ills by the use of motor trucks.

### FORM CLUB IN HAMILTON

Hamilton, O., May 26—The Butler County Automobile Club has been organized with a membership of 200. The directors are chosen from Hamilton and from each township and town in the county, the smaller units being represented by one director each: C. J. Parrish is president of the club; C. B. Atkin, first vice-president; Frank E. Barker, second vice-president, and John M. Beeler, treasurer. A paid secretary will be employed.



## Moock to Washington For Crisis On Car Credits

**N. A. D. A. Manager Will Represent  
Dealers in Hearing Before  
Federal Reserve**

NEW YORK, May 26—In order to care for the interests of automobile dealers in the present economic situation, General Manager Harry G. Moock of the National Automobile Dealers' association will be in Washington Tuesday when the Federal Reserve Board, the Secretary of the Treasury and Class A members of the Federal bank meet in conference.

The meeting follows the institution of restricted credits, begun several weeks ago, as told at that time in *MOTOR AGE*. The developments of the meeting are awaited with interest. Mr. Moock states that the dealers are glad to co-operate in any work which will bring about the necessary readjustment but that any discrimination or "luxury talk" will be opposed.

Mr. Moock to-day visited headquarters of the New York Automobile Dealers' association, which recently affiliated as a body with the N. A. D. A. In Philadelphia yesterday he consulted with President Harry Harper on the subject of the directors' meeting to be held in Detroit June 1 and 2. Important matters affecting the association will be considered at this meeting.

### MONROE, LA., HOLDS SHOW

Monroe, La., May 20—The first motor truck and tractor show ever held in Northwestern Louisiana proved a complete success, attracting about 10,000 persons here, May 14-15-16. The exhibition was given by the Monroe Automobile Dealers' association, and contained a number of features, aside from the actual showing of the work and passenger cars, which helped to draw crowds to Riverside pavilion, where the cars were exhibited. The show opened with a passenger car and truck parade, at 10 a. m., Friday, and the show itself opened an hour later in the pavilion. Monroe and Ruston baseball teams played at the fair grounds in the afternoon.

A reception was held Friday night. O. K. Fraustein, secretary of the Monroe Dealers' association, made the opening address, followed by Mayor Arnold Bernstein, who presented the keys of the city to the visiting dealers of whom about 50 came from New Orleans, and to the visiting motorists from all parts of the state, as well. A. V. Miller, com-

missioner of streets and parks, delivered the address of the local automobile dealers, spoke on "The Purpose of Our Car Dealers' association." C. U. McDowell, of New Orleans, manager of the Louisiana-Mississippi Automotive Trades association, discussed "Our Business," and Judge E. P. Toney, of Lake Village, Ark., spoke on good roads.

Saturday morning, May 15, the show was turned over to the women and children, and in the afternoon there were automobile races and another baseball game. Swimming and diving contests for boys and girls also drew crowds to the river front. The show was kept open Sunday, May 16, and there was a baseball game in the afternoon. This is the first time that side attractions, such as motor races, ball games and swimming contests have been used to attract people to an automobile show in Louisiana, and it proved highly successful.

### RANIER TO INCREASE OUTPUT

New York, May 22—The production program provided for the manufacture of approximately three times as many trucks in 1920 as were built in 1919 is provided for in the new financing of the Ranier Motor Corp. of Flushing, N. Y. To accomplish this program the company is planning the erection of extensive additions to its plant. The new capitalization provides for the issuance of 7500 shares of preferred stock at a par value of \$100.00 of which 7000 will be issued immediately and 30,000 shares of common stock at no par value, all to be immediately issued.

### PACKARD DEALERS MEET

Atlanta, Ga., May 24—Packard dealers from the Southeastern states held a two-day conference in Atlanta, meeting with officials from the Detroit office, including F. S. Strattan, carriage sales manager, C. R. Lester, technical service manager, and J. F. Avery, manager of the Southern district. An important talk, illustrated with actual size drawings, was delivered by Mr. Lester during the conference, on the Packard fuelizer, which, he said, automotive engineers are agreed is one of the greatest advents of recent years in the industry.

H. B. Odell, Inc., distributes the Packard in Alabama, Florida and Georgia, and the party were guests of Mr. Odell.



Members of the Florida dealers' association at the annual picnic

## Senator Owen Attacks Action by Reserve Bank

**Oklahoma Solon Declares Body Is  
"Impairing Confidence" by  
Restricting Motor Car Credits**

WASHINGTON, May 25—Senator Owen, minority member of the Senate committee on finance, and a successful financier, has brought the attention of Congress to the policy of the Federal Reserve board in tightening credits. The Owens letter to Governor Harding, which was read in the Senate to-day, has provoked widespread comment as to the possible damage to industrial enterprise by prohibitive rates on Federal Reserve money.

Senator Owen has advised the governor that the activities of the Board and member banks are "impairing confidence and creating an atmosphere of suspicion, distrust and widespread talk of pending industrial depression and industrial panic." Exception is taken to the methods pursued by the board in an effort to deflate credit. He also takes issue with Governor Harding that high interest rates were required to stop the flood of applications for loans.

Because of the furore created by the Kansas City banks in holding up automobile paper, the opinion of the Senate authority on finance is particularly significant.

### WELCOME TRUCK FREIGHT AID

New York, May 22—That there is no disposition on the part of the railroads to discredit the services given the country by motor trucks is evidenced by the following statement contained in a letter sent by W. G. Besler, president of the Central Railroad of New Jersey to F. W. Fenn, manager of the Motor Truck Division of the National Automobile Chamber of Commerce:

"There can be no question in the mind of anyone concerning the important part the motor truck has come to play in the matter of transportation in this country; nor that it has come to stay and to supplement railroad service just as the automobile and trolley car have supplemented and extended the radius of suburban life.

"The motor truck for intra-city movement and for inter-suburban service will fill a long felt need and will do more economically and efficiently the less than carload lot business which has been forced upon the railroads in the past at a loss to them and must be handled through transfer houses."

# Start Work on Elgin Course For Race on August 21

ELGIN, Ill., May 24—Active work on preparing the surface of the highway for the 1920 Elgin Road Race, which is set for Saturday, August 21, has commenced and to-day the road is even better than it was when the contest was held last fall.

Inspection of the road was made by Charles P. Root, chairman of the contest committee of the Chicago Automobile club, and Fred W. Jencks, manager of the Elgin Road Race association, a few days ago. The road is being regraded and dragged, one grader and two steel drags being engaged in the work of planing out the surface. In addition the road is to be harrowed to break up the hard spots and then it will go through a series of draggings to smooth it before oiling.

To show that the course is still fast, despite a hard winter, Chairman Root went over the north log in the worst

spots at a 53-mile clip in a Lexington car with three persons and equipment for a load, besides having top and curtains up and facing a strong head wind. It is deducted from this that the 183 cu. in. racing cars can easily beat the best record of the heavier cars that have heretofore competed.

Entry blanks for the race are now in the hands of the printer and as soon as they have been approved by the contest board of the American Automobile association they will be sent to all of the prominent drivers for their signatures. A number of officials of the Chicago Automobile club will attend the Indianapolis 500-mile race to interest the drivers who will compete there, including those from abroad.

*Uniontown, Pa., May 24—Ralph Mulford, automobile racing world favorite, is the first famous driver to enter the universal trophy race at the Uniontown Speedway on June 19. Mulford, in wiring his entry, which he did early, in order to be first on the list of entrants, requested that Garage No. 13, known as his private garage at the Uniontown Speedway, be reserved for him.*

## TARGO FLORIO RACE SEPT. 5

Paris, May 6—After numerous modifications the date and the rules of the Targa Florio race to be run on the island of Sicily have been decided on.

This event will be a speed contest of 260 miles run on September 5 over very hilly and difficult roads. The race, which was originally announced for stock cars only, is now open to all types of machines providing they have four-cycle engines. There are to be seven distinct classes, according to piston displacement. The smallest size engine admitted in the race will have 91 cu. in. piston displacement, with maximums of 122 cu. in., 152 cu. in., 183 cu. in., 244 cu. in. and 305 cu. in. for the five classes. The 7th class will be for cars having a piston displacement of more than 305 cu. in.

The Florio trophy, valued at \$1,000, will be given to the winner of the race irrespective of class distinction. There will also be a regularity prize of \$1,000 in cash for the team showing the greatest regularity over the four laps of the course. The race is open to cars of all nations.

## SHERIDAN A G. M. C. CAR

In a news article published in last week's issue of MOTOR AGE, it was stated that D. A. Burke, formerly Buick branch manager in Chicago, was planning to build a new car to be called the Sheridan. For fear this item may have been misleading, the Sheridan Motor Co., of which Mr. Burke is president, is a division of the General Motors Corp. and will build the Sheridan car in the factory formerly occupied by the Interstate Automobile Co. at Muncie, Ind.

The new Sheridan will be built in two models, four and eight-cylinder. Except that it will comprise a full line of standard body styles, further details have not been made public.

## DURAY WINS SOUTHERN RACE

New Orleans, La., May 21—Leon Duray, driving an Elgin, won the 50-mile motor derby run at the fair grounds here in two heats, one May 8 and the other May 9. Lampkin won Saturday's half in 24:33 4/5, with Duray a length behind, but Duray won Sunday's half in 26:00 3/5. Twenty-five miles was run each day.

Duray also won the three-mile dash, beating Koetzle by less than a length; time, 03:10 3/5. Lampkin broke down in Sunday's race.

The 5-mile dash also went to Duray, who beat Cline, driving the Briscoe Wildcat.

Louis Disbrow, driving an Essex, in which one of his gear connections was made with a piece of baling wire, a missing part having failed to arrive, won the three-mile free-for-all.

The dirt track was too rough for records, but the crowd of about 6000 seemed to enjoy the races which were put on by a private promoter. The automobile polo, seen here for the first time, interested the spectators more than the races. A team called the "All-American" beat another team called the "Pacific Coast Stars" by 2 to 1.

## STATE TO BUY SPEEDWAY?

Cincinnati, O., May 22—The site of the Cincinnati Speedway, at Sharonville, has been suggested to the state officials by the Cincinnati Chamber of Commerce as a possible location for the new Institute

for the 'Feeble-Minded, which is to be erected by the state soon.

The speedway site has sufficient area and railroad facilities to meet all requirements and in addition has a large amount of lumber, in grandstands and buildings, which could be used in the construction of the state buildings.

Except for this suggestion, nothing has developed in the matter of disposing of the speedway since its recent public offer at auction brought no bids, even at the minimum price of \$133,333 for which it could have been purchased. It is probable that if the state proposal falls through, it may be offered at a smaller figure soon, by court order.

It is, however, considered virtually certain that the Speedway races, which have been scheduled for this track September 6, will not be held.

## OPEN NEW HOOSIER TRAIL

Indianapolis, May 25—The Dandy Trail, a picturesque and well marked highway, in Marion county, surrounding Indianapolis, was formally opened with ceremonies on two Sundays, May 9 and 16, motorists from all over the state joining with those of Indianapolis in the ceremonies.

The Dandy Trail is 88 miles long, a winding way, designed originally by Mrs. M. E. Noblett of the touring department of the Hoosier Motor club. The Hoosier Motor club arranged the formal opening of the way, which, because of its beauty, is popular among Indianapolis motorists. The trail was named for "Dandy," the Pomeranian dog of Mrs. Noblett.

Mayor Jewett, officers of the Hoosier Motor club and hundreds of motorists, assisted in the ceremonies, which were done in motion pictures and shown at the Circle, one of the leading movie houses of Indianapolis. The Dandy Trail is an argument in Indianapolis for better highways.

## ANOTHER OHIO SLICKER AT WORK

Columbus, Ohio, May 23—A number of Columbus men are looking for a slick stranger who appeared in the Buckeye Capital last January, registered at the Deshler Hotel under the name of Edward Buckley.

He rented space in a local garage and announced that he would go into the used car business under the name of the Columbus Motor Car Co. He placed advertisements in newspapers and soon was able to buy about a score of used cars, paying high prices and giving his note due in 30 days for all of the cars. Before the 30 days were up however he had skipped after selling a number of the cars to innocent purchasers. A suit to replevin one of the cars brought the matter to the notice of the police.

## TO UTILIZE TRUCK TRANSPORT

Milwaukee, Wis., May 21—The first organized effort by manufacturers in Wisconsin to take advantage of the possibilities of the motor truck for freight transportation, due to the breakdown of railroad service everywhere, has been taken by the Wisconsin Manufacturers'



association. George F. Kull, executive secretary, has addressed all members with a request if they wish to join with other members throughout Wisconsin in carrying out a ship-by-truck system reaching as far as New England. Under the auspices of the association, a factory at Delavan, Wis., received a 5-ton load of freight from New England during the past week, and it returned to its base with a load of freight from a factory in Madison, Wis. The replies of members have been very encouraging and it is believed there will be no difficulty in the way of creating an elaborate truck transportation system before the beginning of summer.

#### FREIGHT SHORTAGE HITS TIRES

Akron, O., May 24—Lack of railroad facilities for the shipment of finished tires is a source of great concern to manufacturers in this territory. So serious is the situation that manufacturers are bidding for vacant factory room, storeroom and any space where it is possible to store the finished product.

The subway connecting the Goodyear Tire & Rubber Co. plant with Goodyear hall is filled as are all vacant rooms in the Goodyear factory.

How long this situation can continue is a problem, but many factory executives declare that a shut-down is imperative unless some relief from the freight tie-up develops. Goodyear closed its plant last Saturday morning at 7 o'clock, and kept it closed until Monday. This plan will be continued until transportation conditions improve, or until such time as more frequent interruptions to production, or a temporary shut-down are decided upon.

#### COMBINE TO ENFORCE TRAFFIC LAWS

Rochester, May 24—An organized attempt on the part of the sheriffs of nine counties to stamp out violators of the highway law has been started in this section of the state. The counties participating in the drive are Monroe, Ontario, Yates, Wayne, Livingston, Genesee, Steuben, Orleans and Onondaga. Local constables, state police and deputy sheriffs will be out every night for a month, starting May 25th, in an effort to check the violators at the outset of the motor season.

Marked attention will be paid to violators of the lighting of vehicles, wagons as well as automobiles, fast driving, road hogging and joy-riding parties.

#### PLAN MICHIGAN FARM TOUR

Grand Rapids, Mich., May 24—Plans for an automobile tour to be known as the Michigan Farmers' Tour are being laid out by Secretary Hugh J. Gray of the Michigan Tourist & Resort association, and J. H. Brown of Battle Creek, field editor of the Michigan Farmer, who will lead the party. The tour will be held in August and will cover the Great Lakes way starting from Battle Creek. The tourists will cover the entire upper peninsula.

## Details are Given of French Cars in Indianapolis Race

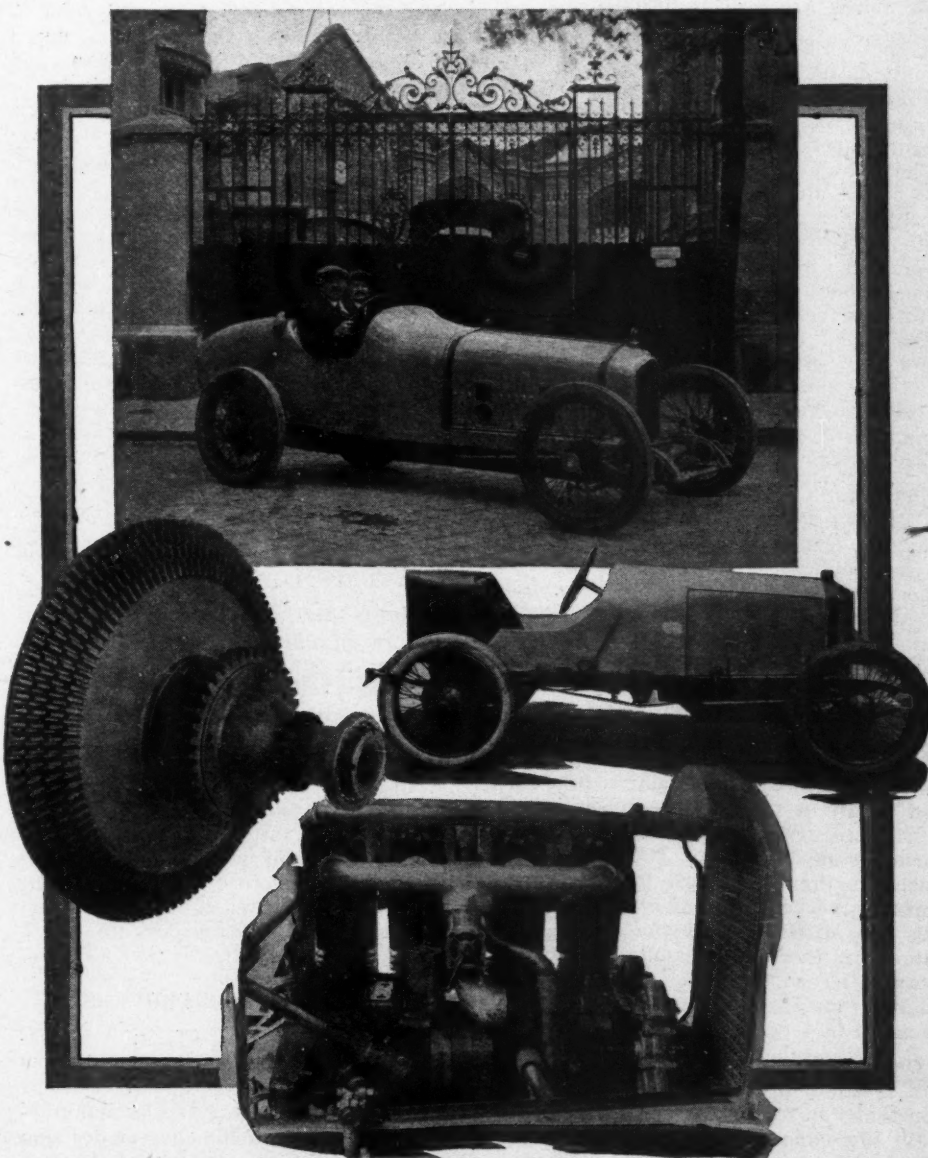
PARIS, May 5—Five more European entries in the Indianapolis Speedway 500-mile race were shipped from France this week. They include the two Gregoire cars built by Porporato and the three Ballots built by Rene Thomas.

As last year, Ballot has built cars with eight cylinders in line, the bore and stroke being 65 by 112 mm. (2.5 by 4.4 inches). There are thirty-two valves, four per cylinder, operated by a couple of overhead camshafts which receive their motion from a train of spur gears. The crankshaft is carried in ball bearings, the connecting rods are tubular, and the pistons are of aluminum alloy. Two carbureters and two magnetos are employed. The latter are mounted on a

platform at the rear of the engine and driven off the extremity of the overhead camshafts. They project through the metal dashboard, where they are under the direct view of the mechanic, and can be readily changed without having to raise the hood. It is understood that the Ballot engines develop 108 hp. at rather more than 3000 revolutions.

There are four speeds and reverses, with change speed lever mounted in the center. The brake lever is on the outside. Hotchkiss drive is employed, with the use of practically flat underslung semi-elliptic rear springs. The cars are built very low and are perfectly streamlined. The underpan extends from the base of the radiator to the bulbous tail,

#### French Racers at Indianapolis



Above, Rene Thomas at the wheel of the Ballot racer; below, one of Jean Porporato's Gregoires; middle left, section of differential on new Ballot showing how four gears are in constant mesh; lower right, a view of the Ballot engine

and thus envelope the rear axle. The front springs are underslung. Both the front axle and the tie rod uniting the spring horns are profiled to reduce head resistance. Double Hartford shock absorbers are employed front and rear. Front wheel brakes are provided for in the design, but as they are not essential for track work, they will only be fitted when the car takes part in road races.

The center of gravity of the cars is very low and sufficient gasoline can be carried in the tank within the bulbous tail to cover the 500 miles of the race.

Both the Ballot and the Peugeot cars have been designed to use straight side tires. Owing to unsatisfactory results obtained last year, wheels have been specially built in France, but as no straight side tires are available here, tests have been carried out on European clincher wheels and tires. The only other European team entered in this race, the Gregoire, with two cars, will use European made wheels and Palmer clincher bead tires.

#### Gregoires Are Special Designs

The two Gregoire cars are special jobs built in the experimental department of a French concern, according to the designs of one of the leading French engineers specializing in racing engines. The cylinders are separate castings of 75 by 156 mm. bore and stroke with four valves mounted horizontally and operated by two camshafts in the base chamber. The form of valve operating mechanism removes the valve springs entirely from the heat of the exhaust gases, and the rods between the cams and the bell cranks are under tension and not under compression. The spark plugs are mounted in the center of the combustion chamber and can be entirely surrounded by cooling water, if desired.

The crankshaft of the Porporato car is a built up type with circular webs carried in five very heavy ball bearings, within addition a ball bearing ahead of the timing gear and another to the rear of the clutch, which is a disk type contained in the engine base chamber. Connecting rods are tubular of BND steel, and are connected to aluminum alloy pistons. A high tension magneto running at half engine speed is employed. The carbureter is a Zenith. Lubrication is very thorough there being a four piston pump in the base chamber, which sends oil under pressure through big diameter pipes and sight feeds on the dash to the main ball bearings and through the hollow shaft to the connecting rod bearings. All the oil is contained in the base chamber, which is heavily ribbed to assist cooling. The engine runs at 3500 revolutions and is declared to develop 100 hp.

One of the features of the Porporato car is four direct drives with pinions constantly in mesh. The efficiency is always the same whatever the drive used. The rear axle mechanism is lubricated under pressure by an oil pump. English made Rudge-Whitworth wire wheels are used, with English Palmer cord tires.

## Ohio Aviators Combine In Club Organization

### Various Cities Are Represented in State-wide Association of Flying Bodies

COLUMBUS, O., May 24—The first meeting of the Associated Aviation Clubs of Ohio, which was held in Columbus May 6 to 8 inclusive, was marked by much interest among the flyers of the Buckeye State, and put aviation as a commercial possibility on the map. The meeting was called by John E. Davis, president of the Aero Club and was responded to by the clubs in Akron, Cincinnati, Toledo, Dayton, Cleveland and Youngstown.

Organization was effected by electing John R. Gammeter of Akron, president; Lieut. Col. Hartz, Cleveland, first vice-president; Williard Talbot, Dayton, second vice-president; Harold Anderson, Toledo, third vice-president; Rex L. Eden, Cleveland, secretary, and John E. Davis, Columbus, treasurer. The board of directors include the officers and Henry Gravenkemper, Cincinnati; L. M. Benedict, Columbus; Samuel Harr, Youngstown; Thomas E. Bennett, Dayton; J. W. Kunneke, Akron, and D. C. Morganthaler, Cincinnati.

Resolutions adopted urge that landing fields be provided under municipal control in all of the cities, but also subject to national and state regulation. A request was also made to the War Department, to turn over to former army flyers all surplus planes in order to permit them to keep in flying trim. Another resolution called on airplane manufacturers to sell surplus planes at cost in order to stimulate flying and also urged congress not to levy any duties on importation of aircraft.

#### DETROIT TIRE MEN ORGANIZE

Detroit, May 20—Tire dealers are planning an organization similar to those existing in St. Louis, Minneapolis and many other cities to protect tire users from the unscrupulous dealers who sell inferior tires of orphan manufacture and misrepresent the brand. Many complaints have reached tire dealers, and the Detroit Automobile Dealers' association regarding the crooked practices of some dealers, and determination to perfect an organization to bring about their elimination was taken up at an informal meeting of leading tire dealers this week.

#### FEAR PATENT CONTROVERSIES

New York, May 22—Patent controversies which may involve several firms constructing honeycomb and cellular types of radiators are feared by manufacturers as a result of the adverse decision by the United States Court of Appeals here against the Mayo Radiator Co., of New Haven, Conn., in the infringement suit brought by the Whitlock Coil Pipe

Co., of Hartford, Conn. A petition for a rehearing has been filed by the Mayo company, which is a subsidiary of the Marlin-Rockwell Corp., and the outcome is being awaited with interest.

The infringement suit was filed several months ago, and in the lower courts resulted in a decision favoring the Mayo company. This, however, was appealed and the Whitlock concern, basing its allegation of infringement on a patent issued to Louis Herman Brinkman of West Hartford, was successful in the appellate body.

The Brinkman application was filed in 1903, and was issued as Patent No. 843,864. It is based upon the use of a continuous strip of metal in forming the radiator, the material being bent into curved form that provides the customary air and water spaces. This was said to be a departure from the methods utilized in the original Mercedes radiator and, in view of the sweeping action of the Appeal Court, may involve several types of passenger car radiators.

The wording of the patent states that the radiator is made "by constructing from a continuous strip of sheet metal which is crimped or corrugated, so that when the corrugated sheet is bent or returned upon itself at regular intervals the corrugations will match and form the opposite sides of a tubular space for the passage of air."

#### ST. LOUIS ACCESSORY MEN ELECT

St. Louis, May 20—The Motor Accessory Trade of St. Louis has elected the following officers: President, George A. Holthaus, president Holthaus Saddlery and Auto Supplies Co.; vice-president, L. C. Blake, Curtis Pneumatic Machinery Co.; treasurer, A. R. Baxter, Inland Machine Works; secretary, Capt. R. E. Lee, editor Auto Review; sergeant-at-arms, Willis Malone, Jr., O. K. Harry Steel Co.; directors: L. E. Allmon, Missouri Auto Specialty Co.; A. E. Bosley, Banner Accessory Manufacturing Co.; Frank W. Bradley, manufacturers' agent; William L. Ferrier, Fred Campbell Auto Supply Co.; and G. G. Giese, Alastic Tire Cushion Co. Officers will be installed at Forest Park Highlands on the evening of June 8, which will be ladies' night.

#### NO CUT IN MOTOR CAR PRICES

Omaha, May 20—Press reports which stated that prices of automobiles had been cut in Omaha along with those of merchandise were misleading. They were based on an announcement by Pelton, the Franklin dealer, that he had on hand several Franklins bought prior to the recent advance and that he would sell them at the old price.

#### 1921 LAST SHOW AT PALACE

New York, May 20—No automobile expositions will be possible in Grand Central Palace after the 1921 show, if the organization headed by Alfred I. du Pont, which owns the building, carries out its plan to convert the building into a business building. Since 1912 the Palace has housed practically all of the big expositions in this city.



With its four exposition walls Grand Central Palace afforded a larger area of floor space than any other auditorium in the city; not excluding Madison Square Garden. The latter place, suitable for many of the events held in Grand Central, is mostly occupied with sporting events, making it difficult to obtain for exhibitions or conventions.

When the leasehold of the building was taken over by the du Pont organization it was announced that the building would be used as a great market place for the exhibition of goods from various parts of the world for domestic buyers. The International Exposition of Industries was the name given to the market place. Since that time the demand for space for business purposes is believed to have led the leaseholders to change their plans.

Originally it was planned to change the character of the building dating from Jan. 1, 1920. Protests caused this to be abandoned but notices have now been sent out by Frederick W. Payne, manager of the building, saying this plan would be carried out dating from April 1, 1921.

#### TROUBLE IN OHIO ROAD BONDS

Columbus, Ohio, May 23—According to a recent court decision bonds for road improvement, for which proceedings were started prior to the time of the amendment of the law can not be sold under the new rate of 6 per cent. It is necessary to start proceedings after the amendment was adopted. This will delay a number of road improvement projects in the Columbus district.

#### ORGANIZE TRACTOR CLUB

Indianapolis, May 25—The Indiana Tractor club has been organized by representatives of various tractor companies with officers elected as follows: R. D. Rutherford, of the John Deere Plow company, president; W. H. Burgess, of the J. I. Case company, vice-president; E. L. Jacob of the Twin City company, secretary-treasurer.

#### WANT ROAD MATERIALS

Columbus, Ohio, May 26—Vigorous protests on any priority order which would prevent rapid movement of road building materials have been made by Charles H. Duncan, secretary of the Ohio Contractors' association and others to the Interstate Commerce Commission. It is urged that anything which would tend to hamper the movement of road materials would be a great detriment to the road building program. The road improvement program is necessary in order to encourage the ship by truck movement which relieves the railroads in these times of stress.

#### OHIO TO BUILD ITS ROADS

Cincinnati, O., May 25—A statewide rumor that Ohio's program of road building and improvement was to be abandoned this year, was denied by A. R. Taylor, State Highway Commissioner in a letter to W. T. Calverline, of the Cincinnati Automobile Club.

## Seventeen Air Taxi Lines Formed in Dominion

Passenger Flying Is First Object, But  
Freight Handling May Follow  
at Later Date

OTTAWA, May 22—No less than seventeen aerial taxicab companies are being formed in western Canada, and a number of these have been already licensed by the air board. Lieutenant-Colonel Scott, who has active charge of the certificates branch of the air board, has just returned from a tour of inspection of the west, and reports great activity and possibilities for very real development of commercial flying in that part of the Dominion. Air routes for transcontinental flights are established, experiment has established the best kinds of machines for different parts of the flight, and only ground organization is lacking to make passenger routes from coast to coast an every-day possibility.

Four commercial flying companies have been floated in Winnipeg, one will be formed in Brandon, an air-drome is to be built at Virden, Man.; there is one commercial flying company in Regina, one in Moose Jaw, two in Saskatoon, two in Edmonton, one in Hanna, Alta.; one in Calgary, one in Lethbridge, one in Banff, and two in Vancouver.

Passenger flying is the first object of all these companies. Mail carrying and distribution for department stores is expected to follow soon. The real obstacle to the extension of the traffic is the lack of ground organization. The other obstacle, depreciation in equipment, will be removed with the advent of metal machines. Adjustment of loans will make the actual flying easy across the continent, and the development of ground organization will simplify not only Dominion-wide traffic, but will link Canada with the round-the-world flights, which may be an accomplished fact before the end of the year.

#### TEXAS GETS ARMY TRUCKS

Austin, Tex., May 22—Many of the counties of Texas are being well provided with road building equipment, including motor trucks, through the good offices of the Bureau of Public Roads of the Federal Government. This equipment is a part of that which is being distributed to all the states under an act of congress, which provides for the distribution, free of charge of surplus motor-propelled vehicles and other items of road-building equipment to the various state highways departments for use in the construction and maintenance of highways.

This distribution is free of charge, meaning only, however, that the War Department is not recompensed for any part of the original cost of the equipment. All cost of loading, shipping, unloading, receiving, repairing and putting the equipment in shape for operation is necessarily born by the various states

to whom it is allotted and in the prosecution of this program the State Highway Department of Texas has in the last nine months spent approximately \$200,000. Of this amount \$115,000 has been paid out for freight charges alone and roughly \$4000 has been paid to the War Department for loading the equipment at the various camps from which it originally came. This expenditure has covered the receiving to date of over 850 motor trucks; valued at \$2,500,000; a portable asphalt plant, valued at \$20,000; a stock of spare parts for Nash trucks, valued at over \$100,000 and a limited amount of minor miscellaneous road-building equipment.

Of the motor trucks 636 have so far been delivered to the various counties of this state. In addition to the 850 trucks which have already been received, 200 more have been allotted this state and will be taken over by the State Highway Department as rapidly as they can be handled.

These trucks are being leased by the State Highway Department to the counties at the very nominal rental of \$2 per month, but in order to secure the lease of a truck the county must reimburse the department for the actual cost of receiving this equipment. This cost is pro-rated over all of the trucks and an average of \$250 per truck covers the cost of delivering these to the counties.

#### TRUCK MEN PLAN OUTING

Philadelphia, May 25—The sixth annual outing of the Motor Truck association of Philadelphia is being prepared for, far in advance. It will be held at Kugler's Mohican club-on-the-Delaware, on Saturday afternoon, June 12, rain or shine. Automobiles will leave the quarters of the Philadelphia Automobile Trade association, Broad and Callowhill streets, promptly at 1 p. m., headed by a band of thirty-five pieces, and R. Arthur Bittong, chairman of the entertainment committee. The members of the Camden Automobile Trade association, the Philadelphia Automobile Trade association and the Automobile Accessories Business association have been invited to attend.

There will be a baseball game between teams representing the Camden Automobile Trade association and the Motor Truck association.

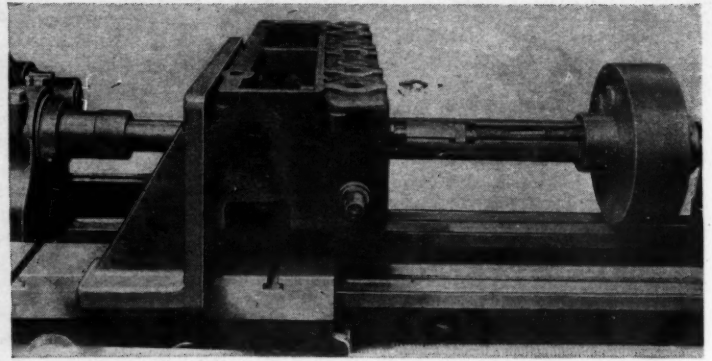
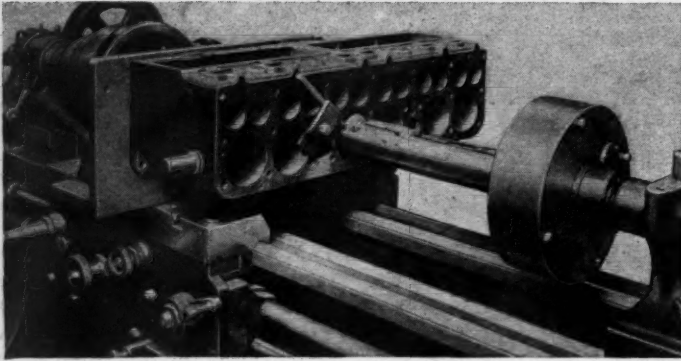
#### WILMINGTON DEALERS ELECT

Wilmington, Del., May 25—The Wilmington Automobile Trade association has elected the following officers for the ensuing year: F. B. Norman, president; H. A. White, Jr., vice president; E. C. Ulrich, secretary; E. F. Merrick, treasurer; W. A. Macdonald, N. O. Howell and Harry R. Loose, members of the board of governors.

It has been decided to make permanent the weekly luncheons, at noon on Mondays, which were started as an experiment a short time ago. All ordinary business matters will be thrashed out at these meetings, which will eliminate the necessity for frequent night sessions.

# THE VULCAN PRECISION GRINDER

For Machining Worn or Scored Cylinder Walls. Requires No Belt or Countershaft



This machine operates between the centers of a lathe and is driven from the head stock, thus eliminating extra countershafts and belt. Its grinding wheel revolves in a fixed path and the cylinder being ground is moved past it, it being possible to grind with the work moving in either direction

**T**HE service station, repair shop or garage that wishes to render really satisfactory service, faces the purchase of suitable equipment for oversizing engines is now generally conceded by practically all those connected with the automotive industry, except the reactionary and the incompetent. Wear of cylinder walls is entirely unavoidable in all engines. The time at which this wear becomes sufficiently great to necessitate attention is dependent to a great extent on the method of finishing or refinishing the cylinder wall. Cylinders finished by the grinding method will usually render the better service.

The action of a grinding wheel is to cut away all interfering metal. A grinding wheel closely resembles a stone, but is a scientifically compounded instrument built particularly for the metal which it is to cut.

Satisfactory grinding machines have been placed before the automotive industry, but because of price and the skill which was necessary for operation these machines are beyond the reach of any concern, except one such as a big machine shop or a factory specializing on

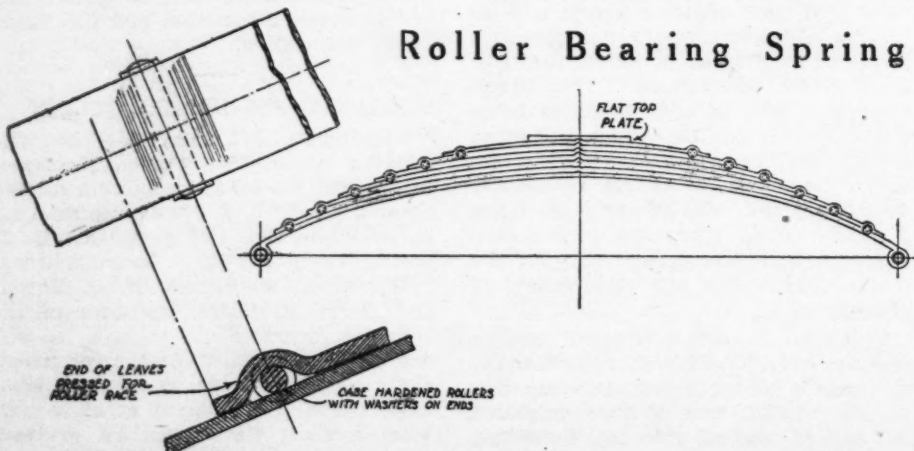
automotive work and having a large territory from which to draw business.

The Vulcan precision grinder, shown herewith, places before every service station, repair shop and garage a grinder for economically and accurately machining worn or scored cylinders. The price is \$325. It comes complete with a machined angle plate, extra grinding wheel, diamond dresser for the grinding wheels, driving head and tail spindle bushing. It requires no belt or counter shaft, as it operates between the center of a lathe and is driven from the headstock. Its installation and operation is simple. The grinding wheel is adjustable to one thousandth of an inch by a simple device, and travels continuously in a fixed orbit, the cylinder which is being ground moving slowly past it. For this reason great accuracy can be obtained, it is said. The grinder will function when the cylinder centered upon it is traveling in either direction, therefore the production of a tapered hole is practically impossible.

The bronze bearings are tapered, adjustable for wear, and run in a bath of thin oil. This machine is a precision tool and capable of oversizing a cylin-

der to any given oversize measurements. It was designed for use on engines having removable heads, but it is applicable to approximately 87 per cent of the engines used in American cars. Although cylinder grinding prices vary somewhat, it is probable that the charges will never be below \$3 per cylinder for the grinding, exclusive of transportation charges, pistons, piston pins or rings. At these figures it is obvious that the handling of a limited number of engine blocks will pay the original cost of the grinder. It is claimed that during the process of grinding a block, but little over half of the time of one man is required to operate the tool. The grinding wheel of the Vulcan is supported solidly at both sides, said to be an advantage over the types having the grinding wheel mounted on the end of a spindle. The latter overhangs its bearings and is, therefore much more sensitive that that of the Vulcan type and incapable of as heavy a cut. The wear on the grinding wheel of the Vulcan grinder is almost negligible, the claim being that it will not wear down to exceed one-half thousandth of an inch in grinding a six-cylinder block.

## Roller Bearing Spring Latest Invention



The rollers reduce the friction between the spring leaves and the action of the roller spreads the lubricant

Shown in the accompanying illustration is a new type of spring invented by Dan Bruhn of Hammond, Ind., which has the feature that the friction between the spring leaves is reduced very much by virtue of the rollers set in between the leaves. A flange on the end of each little roller slips over the edge of the spring leaf and thus keeps the roller in perfect alignment. A nib is punched out in the end of the spring leaf and into this nib the roller is lifted. This leaves sufficient space to force the lubricant between the leaves and the action of the roller will then spread the grease as well as reduce the friction when the springs are flexing.

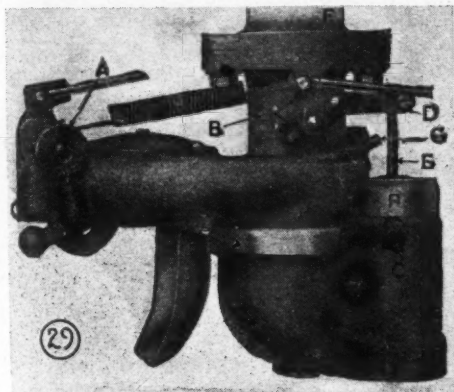


# ADJUSTING THE CARBURETER

The Fourth and Last of a Series of Articles on the Adjustment of All Makes of Carbureters  
Used as Standard Equipment on all Cars. Makes Using Their  
Own Carbureters Are Taken Up Individually

**T**HE general construction of the Cadillac carbureter follows the concentric float feed single jet type, but with a number of features exclusive to the Cadillac carbureter. Before attempting any adjustments with this carbureter, or with any other for that matter, we again caution the operator to be absolutely certain that the carbureter needs adjustment.

Should it be found that the Cadillac carbureter needs adjustment proceed as follows: Open the throttle lever about 2 in. on the sector of the steering wheel. Place the spark lever in the driving range on the sector and start the engine. If the engine is cranked by hand the



The Cadillac carbureter

spark lever should be placed at the extreme left on the sector. The engine should now be run of course, until the water jacket on the intake pipe is hot.

Move the spark lever to the extreme left on the sector and the throttle lever to a position which leads the throttle in the carbureter slightly open, adjust the air valve screw "K" Fig. 29, to a point which produces the highest engine speed. Turn the screw "A" in a clockwise direction increasing the proportion of gasoline to air in the mixture and vice versa.

Next close the throttle, move it to the extreme left on the sector and adjust the throttle stop screw "B" to a point which causes the engine to run at a speed of about 300 revolutions per minute, the spark lever should be at the extreme left of the sector when this adjustment is made. With the spark and throttle levers at the extreme left on the sector adjust the air valve screw "A" to a point which produces the highest engine speed.

Open the throttle until the shutter attached to the right hand end of the

BY ROY E. BERG

throttle shaft just covers the slot in the carbureter body. Then adjust the screw "G" to a point which produces the highest engine speed, or to a point where the engine slows down slightly from the lean mixture, turning the screw "G" in a clockwise direction increases the proportion of gasoline to air in the mixture and vice versa.

During very cold weather a slightly richer mixture is desirable; it may be found best to turn the adjusting screw "G" further in a clockwise direction.

After the carbureter has been in use for some time there may be a slight amount of wear at the point of the inlet needle at its feet. If this should occur the height of the gasoline in the carbureter bowl will rise.

To determine if the float is properly set, remove the carbureter from the engine and the bowl from the carbureter, raise the float until the inlet needle valve is just closed. The dimension "A" Fig. 39 should then be  $\frac{1}{2}$  in. The setting may be corrected by bending the arm slightly to which the float is attached.

The Cadillac carbureter is equipped with a throttle pump, the object of which is to force gasoline through the spraying nozzle when the throttle is opened quickly for acceleration. When the throttle is opened slowly the throttle pump has practically no effect on the amount of gasoline passing through the spray nozzle. The cylinder "C" Fig. 29 on the carbureter bowl contains the plunger which is operated by the throttle by means of the connecting rod "E."

The Franklin carbureter used on the Franklin car is of the single jet air valve type. The single spray nozzle has four branches, each branch being drilled with a No. 64 drill. With this carbureter both the needle valve and air intake are adjustable from the dash. There are two air intake passages, one, which draws air under atmospheric temperature, and the other which draws air in over the heating stove. A rotary disk which is controlled by the heating regulator on the dash, moves over both air intakes and is operated so that it admits cold air and hot air or restricts the air supply completely.

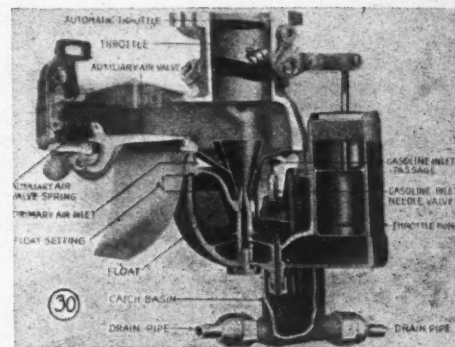
The level of the gasoline in this carbureter should normally be  $\frac{5}{8}$  in. from the bottom nut on the float valve stem to the beginning of the seat of the stem. With this setting the level of the gasoline is  $\frac{1}{2}$  in. below the spray nozzle opening. Screwing the adjustment nut up low-

ers the level and screwing it down raises it.

It is an indication that the auxiliary air valve needs adjustment when the manifold loads up and the engine displays lack of power. First examine valve seat to see that it is not marred or grooved. The proper screw to turn is that designated by letter "F" in Fig. 31. When the engine is throttled down very slowly, the valve should seat, but only so slightly that it will open as soon as the engine is accelerated.

While the carbureter employed on the Locomobile is a Ball & Ball type, still, it is different from the ordinary Ball & Ball carbureter, so that its classification may be termed an individual type.

The carbureter (Fig. 32) is of the two-stage type; in fact, it consists of two distinct carbureters in one. The low speed jet 1 for ordinary running is directly connected to the float chamber 2. It is intended for all ordinary usage from idling up to a maximum speed of 40 miles an hour. Continued pressure on the accelerator or a wider opening of the throttle by means of the hand control lever, cuts in the second or high speed jet 3. The arrangement is such that not only is the jet itself uncovered and allowed to work, but an additional direct air passage is opened. This joins the main vaporizing chamber at a slight angle, so that the additional gases mingle with those from the low speed jet



Cut-away view of the Cadillac carbureter

quickly, readily with little wall friction.

The low speed air valve 4 is adjustable by means of an external nut, which varies the tension of the retaining spring. However, the construction is such that at varied speeds within the range of the low speed jet a precise quantity of air is drawn through accurately calibrated openings.

The adjustment on the steering column

works upon a butterfly valve in the hot air pipe so that by moving it, the amount of air may be increased or decreased, thus making the mixture weaker or richer. That is, the steering column adjustment varies the amount of air entering at all speeds.

The fuel enters through the shut off valve 5 to a settling well in the base of the carbureter float chamber. Here any impurities will settle and be filtered out by the strainer 6, which may be removed from time to time for cleaning. The flow of the fuel to the float chamber is controlled by a float 7 and a needle valve 8. The float is of spun copper, carefully made as to weight and volume. The needle valve is of non-corrodible metal and the valve and seat are designed to prevent surging of the fuel into the float chamber and to obtain a steady flow. The level of the fuel in the float chamber is carefully determined and set at the factory. The end of the needle valve is protected by a cap 9 which may be removed when it is desired to try the needle valve or flood the carbureter. The fuel enters the base of the carbureter through the passage A, passes into the hollow low speed plug P to the low speed atomizing nozzle. This has perfectly straight walls and a vertical opening so that the fuel is drawn directly upward by the strong rush of air through the venturi passage, readily and without friction. The venturi 10 is set in the base of the vaporizing chamber, and its side walls are drilled with a series of holes H, so that any fuel which condenses flows through these, and is again picked up by the air and vaporized. The high speed jet P, projects into the high speed vaporizing chamber just beyond the venturi, and is covered and uncovered by the high speed throttle. When covered it does not operate. In shape it differs from the low speed in that the drilled hole at the top is a very fine one leading down into the larger opening beneath. This is necessary because of the need for enriching the fuel. The holes are drilled with extreme care and the novice should never tamper with them. They are readily removed, but to guard against tampering are sealed in place.

The venturi tube or throat is removable. The diameter and shape of this

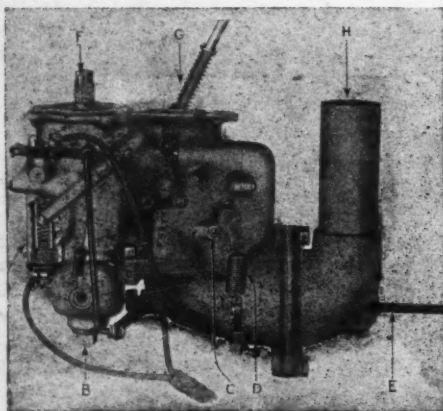
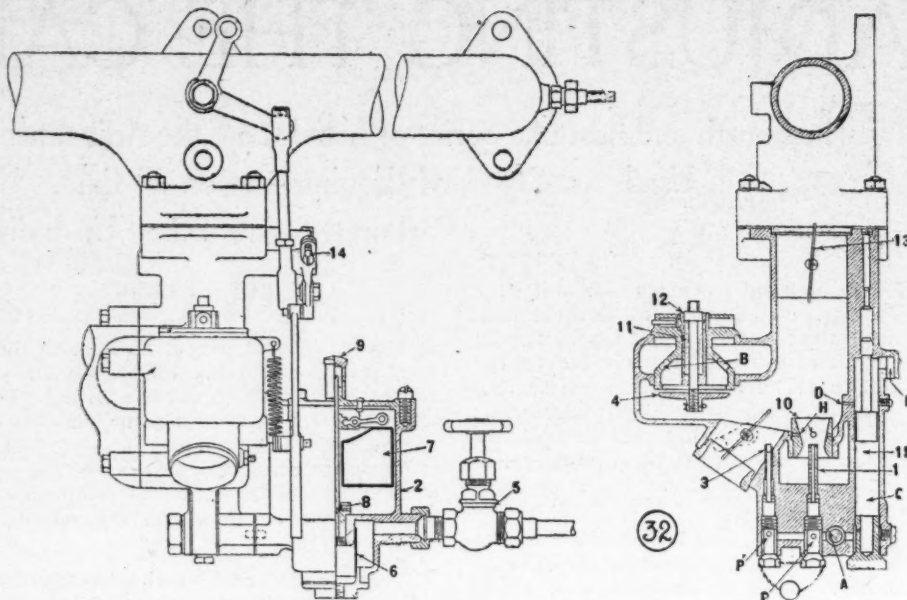


Fig. 31—Carbureter used on Franklin



The Ball & Ball carbureter used on the Locomobile

throat have been carefully worked out and should not be altered. Its sides are drilled so that all condensed fuel will flow back and be vaporized.

The main air supply enters the carbureter from above and describes a kind of U curve before passing up the vertical vaporizing chamber. At the bottom of the sweep of the U the two nozzles are placed, so that in this sweep the inrushing air picks up the fuel. The air chamber is open to the atmosphere from above and air entering there passes down through a series of carefully drilled holes, thence through the opening above the air valve. This air valve is controlled by means of the spring 11, the tension being regulated by the air valve adjusting nut 12.

When the high speed jet is uncovered and begins to operate, its individual air supply is carried in through the high speed air opening, which is uncovered at the same time. As will be noted, this air sweeps directly across the top of the high speed jet opening 3, thus picking up the fuel and carrying it into the vaporizing chamber.

The carbureter is fitted with a butterfly throttle valve 13 for controlling the engine. This valve can be operated either by a lever on the steering column or by the foot accelerator. A screw 14 is provided on the carbureter for adjusting the idling position of the throttle valve.

The low speed jet is normally set in a very lean position. As is well known, a lean mixture does not give good acceleration, so a special accelerating device is added to compensate for this. This will be noticed at the right hand end of the figure, and consists of a plunger 15, set in a passage at the back of the carbureter, which at the instant that the throttle is opened and acceleration is most necessary, automatically enriches the mixture to a marked degree. It is, in fact, practically a rich fuel nozzle which operates only when

the throttle is closed or nearly closed. As will be noted in the figure its supply of gasoline enters at the base into the well. The plunger 15 has an upward extension working loosely in a passage, to which the air enters through a small exterior opening D. At the top of this passage, a small hole is drilled into the intake manifold, above the throttle, at an angle. It can be seen from this that the fuel enters at the base, flows up around the plunger with a small amount of air entering at D, later entering the inlet pipe above the throttle. When the throttle is closed, or nearly so, this plunger is held up by suction. When the throttle is open this suction is released and the piston falls. This displaces fuel below it in the well C, causing it to flow up to and out of the hole D.

This is swept upward into the vaporizing chamber by the swift air current, enriching the mixture temporarily and giving a powerful pickup. As long as the throttle is held open the plunger remains down, and as soon as the throttle is closed even partially the plunger is raised again ready for another pickup.

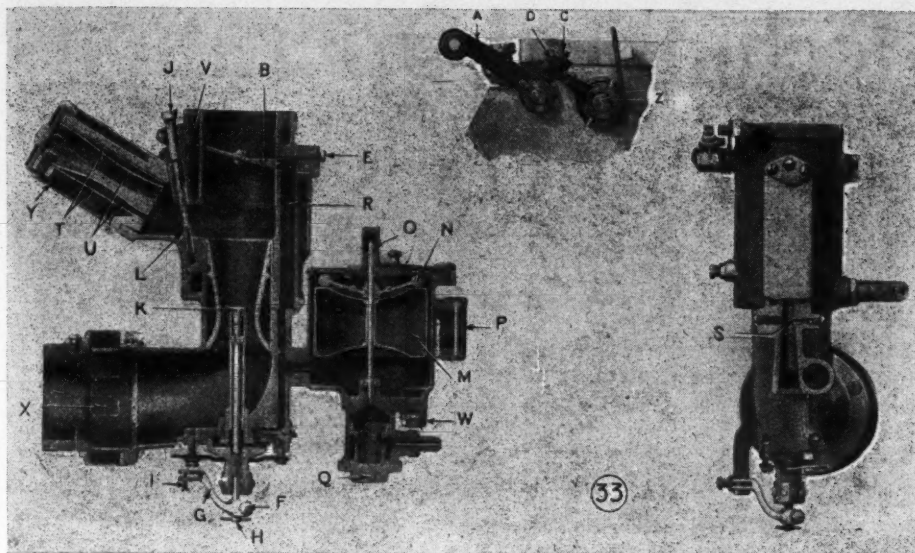
The main air supply can be either hot or cold as desired. A stove or heater is placed on the exhaust manifold and the air is led through a brass pipe to the shutter on the carbureter main air intake. The shutter may be manipulated to secure any combination from all cold to all hot air.

To make adjustment on this carbureter the following is recommended: 1—Turn the air valve adjusting nut 12, Fig. 32, up until the air valve seats firmly. This gives a temporary starting adjustment.

2—Turn the steering column adjusting collar to the full rich (or starting) position and start the engine. Run it long enough to get the engine hot. In summer open the slide in the stove on the exhaust pipe about two inches. In winter close the hot air stove slide, until it is open about  $\frac{1}{2}$  in.

If the carbureter has not been taken apart, the jets will be in correct adjust-





Carburetor used on the Pierce-Arrow is of the two-stage type

ment and will need no attention. These can be tried in a few minutes running of the car.

3—Now stop the car but not the engine. Turn the air valve adjusting nut 12 back gradually until the engine runs smoothly, gradually slowing the engine down a little each time by means of the idling screw 14 until the engine idles steadily at 275 to 300 r.p.m.

This carburetor setting is very lean, so that good economy is obtained. The low speed setting is so adjusted that the carburetor pops when starting cold, and when running on one jet alone the carburetor should show very little power. If the carburetor is set correctly, it will be necessary to throw the steering adjusting collar around to full rich position to keep the carburetor from popping when the engine is cold. As soon as the engine warms up, the steering column collar should be turned back to the full lean position and left there for normal operation of the car and the idling adjustment should be made for this position.

The Pierce-Arrow carburetor is also of a two-stage type and is of special construction, as the illustration in Fig. 33 shows. There are two separate and distinct nozzles designated by the letters "K" and "L" with a throttling passage designated "R" which is controlled by the screw "E". This carburetor is automatic in its action. The adjustment is accomplished as in the following description and instructions:

The float chamber is screwed to the carburetor at a fixed position and adjusted so that the gasoline level in the chamber is  $\frac{1}{8}$  in. below top of spray nozzle "K". The opening in the spray nozzle is regulated by a valve "H". When the gasoline gets below its proper level, the float "M" and its levers "N" drop, permitting the float valve to open. This allows the gasoline to fill the chamber to its proper level. There is a glass window "P" provided in the float chamber, to ascertain the height of the gaso-

line. The float chamber is connected to the gasoline tank by the pipe, through which the gasoline is forced by air pressure in the tank.

The throttle, needle and reed valves operate according to the following: When the engine is running very slowly, the throttle "B" is just starting to open, so nearly all the air comes up through the passage "R", where it is mixed with gasoline regulated by nozzle "S". The amount of mixture entering the cylinders is regulated by the adjusting screw "E", which is really a throttle for the small passage "R". The three auxiliary air inlet reed valves are closed. As the throttle "B" opens more, the suction "R" becomes greater for a short period and then becomes the same as through the main passage. As the engine speeds up, the light, intermediate and heavy reeds open in succession admitting more air.

The supplementary springs "U" form gradual stops of a progressive strength on the reed valves. The distance between the reed valves and the supplementary springs, should be for the light reed,  $\frac{1}{8}$  in. and for the intermediate and heavy,  $\frac{1}{4}$  in. When these reeds are once set, they should need no further attention in the adjustment of the carburetor. The supplementary spray nozzle "E" is provided with an adjustment needle valve "J", which comes into action at high speed and as the reed valves open.

1st—See if gasoline level is even with mark on post in sight glass of float chamber—engine not running and car standing level as possible.

2nd—Disconnect throttle rod from lever and close main throttle "B" tight by backing off on screw "C". Adjust this screw until it just touches lever "A" at beginning of straight surface—then screw in  $\frac{1}{4}$  to  $\frac{1}{2}$  of a turn more and tighten lock nut "D". Connect throttle rod to operating lever adjusting length of rod so throttle just begins to open.

3rd—Turn idling throttle screw "E"

into shoulder—until head of screw seats, then back out about  $1\frac{1}{2}$  turns.

4th—Loosen screw "F" on lever "G"—turn needle "H" to the left or until it is on its seat—then turn right to open  $\frac{1}{4}$  turn.

5th—Start engine by priming and allow engine to run until warm—run on battery with lever advanced about  $\frac{1}{2}$  in. on quadrant—open throttle until an engine speed equal to 20 or 30 m.p.h. is obtained—adjust needle "H". When engine runs best, set lever "G" at right angles to center line and tighten screw "F"—set regulator on steering column in center and put wire in lever "G" and tighten screw "I"—this should give equal travel each side of center.

6th—Loosen lock screw on high speed needle "J" and with fingers screw down to seat until closed—then turn back or up to  $\frac{3}{8}$  to  $\frac{1}{2}$  turn.

7th—Test car on road—it should not be adjusted to run slower than 5 or 6 miles. Always keep throttle screw "E" closed as much as possible. If car works best at a speed of 20 to 30 m.p.h. with regulator in center adjustment on needle "H" it can be considered O. K. If at 50 miles it will run better, set to the heavy position—it means high speed needle must be opened more and the reverse if it runs best on the light side. If properly adjusted, it should run through the whole range of speed with regulator in one position. The only change necessary is to take care of climatic conditions. All locking or clamping screws should be tightened when adjustment is complete.

The idling adjustment does not have any effect on other adjustments—it becomes ineffective as soon as throttle has uncovered idling passage.

With throttle "B" adjusted and in closed position, only a very small amount of air passes up around nozzle "K", the velocity of air being so low that no gasoline is drawn from nozzles "K" or "L" while the suction in idling passage is very high. The throttle screw "E" is used to control this suction and velocity.

Best results are obtained by keeping the opening of screw "E" as small as possible. As the throttle "B" is opened, it continues to uncover the idling passage for about 10 deg. During the first part of this movement, the suction increases, then decreases, due to the opening around valve "B". The volume of air or velocity around nozzle "K" has now increased and nozzle "K" is supplying the mixture, the idling adjustment going out of action, owing to the drop in suction at this port or passage. At a speed of 20 or 30 m.p.h. the high speed nozzle "L" begins to supply gasoline.

The Packard carburetor is of the air valve type with a single spray nozzle. This carburetor is automatic and should require no adjustment, outside of attention to the auxiliary air valve spring. This spring should need adjustment only

(Concluded on page 43)

# Standard Mechanical Operations in Tractor Service

by John Charles Thorpe, M.E.  
and Gustav Howard Radebaugh



**EDITOR'S NOTE:** The two pages herewith are the sixteenth of a series covering the service operations on tractors, although the same can be applied quite generally to passenger car and truck engines. In the last article in *MOTOR AGE* we told in part the operations necessary to repair or replace a faulty pump impeller. This installment is a continuation of these operations. The views should be studied closely, and the tools used as shown. The operations are depicted in the approved manner and should be followed to secure the best results.

## PART XVI—THE COOLING SYSTEM

### Locating and Repairing or Replacing Pump Impeller

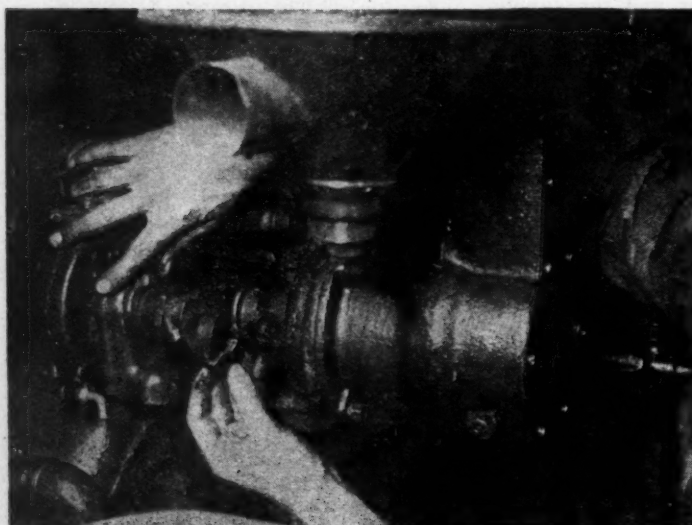
(Continued from last week.)

The water circulation is maintained by a centrifugal pump, driven from a gear on the camshaft, by direct connection on an auxiliary shaft driven from a special gear assembled with the engine gears, or by direct installation on an extension of the crankshaft. In some instances, the pump is installed on what is known as the half-time shaft, whose principal duty is to drive the magneto.

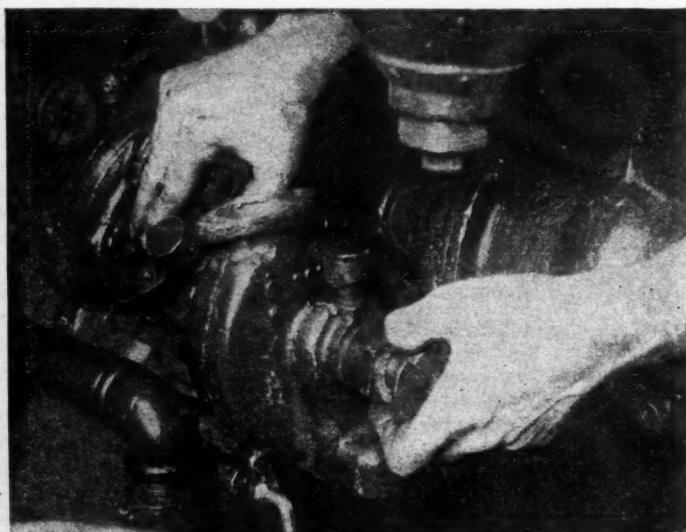
The pump, which is of the centrifugal type, draws the water through a proper connection from the bottom of the radiator and forces it through the water passages of the engine and

out into the top radiator section. Under the pump pressure it passes through the radiator tubes or honeycombs, where a great deal of heat is dispelled into the current of cold air passing over the radiating surface under the induced draft of the fan. It passes to the base section and is ready for a repetition of its cycle.

It will be seen that there is a lot of work for the pump to do. Occasionally, due to foreign matter getting into the pump, freezing or faulty material or workmanship, the key or pin, fastening the pump impeller to its shaft, breaks or shears. The repair involves an interesting service operation.

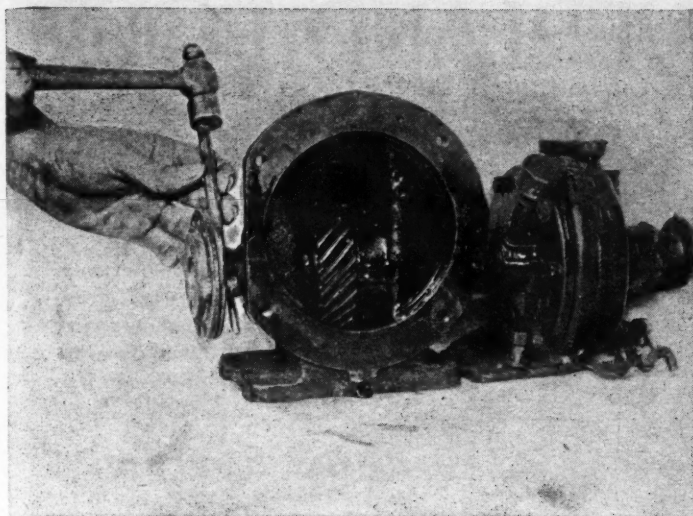


5. Loosen pump on its foundation and remove driving plate from coupling on the half time or auxiliary shaft. Care should be exercised in this operation to see that there are no parts binding

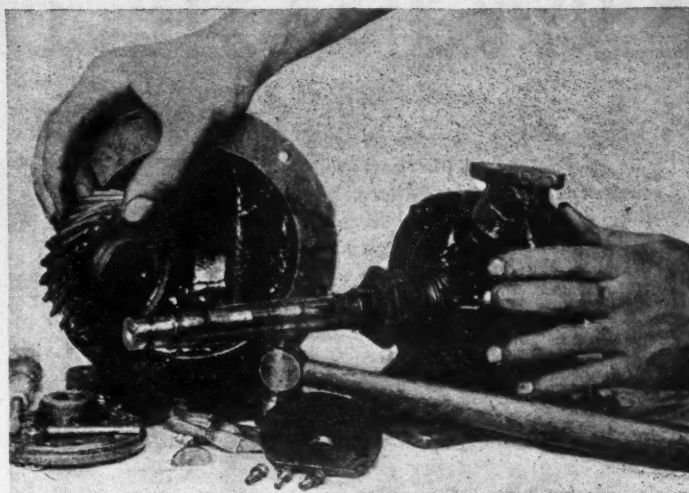


6. After loosening pump and removing driving plate from coupling, remove pump assembly and gear housing carefully from its position on the engine base





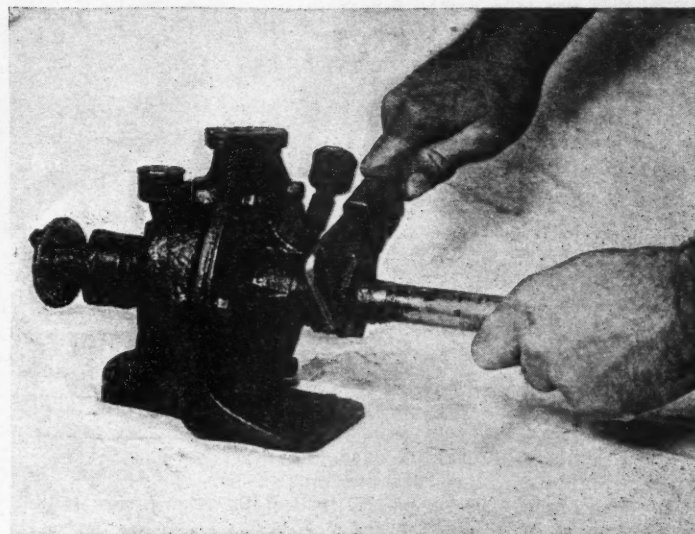
7. To remove the pump assembly from the gear housing drive out the pin fastening the driving plate of the coupling on the opposite side of the gear assembly



9. Remove the pump assembly, drawing the driving gear from the shaft



8. Remove the driving plate of the coupling from the shaft. With a light machinist's hammer and easy blows, drive the pump shaft loose in its bearings. A piece of lead should be placed over the end of the shaft to prevent marring



10. Remove the packing nut and packing from the pump shaft. Occasionally there is a water leak noticeable at the pump. The adjustment of this packing nut will ordinarily stop this leak if the packing is in good condition

Illustrations showing the operations in repairing or replacing a faulty pump impeller will be continued next week

## THE RAILROAD AND THE MOTOR TRUCK BUSINESS

(Concluded from page 21)

is by becoming the prime mover in a movement to mobilize truck transportation. If you have an association the work can be done there. If not, a committee of dealers can do it. Or, the local Chamber of Commerce can be urged to do it. The job is to gather in one central place data as to how many trucks of different sizes there are in your locality that could be mobilized for emergency work if necessary. Should it be necessary to drive several hundred miles for coal or food or other necessities these trucks could be used for that purpose. It's the old war-time job right over again, with the exception that now we have the war experience to guide

us. In Newark, N. J., during the war the dealers had 8500 trucks ready, eating stations located, shops lined up, and everything ready to truck coal from the Pennsylvania mines to New York City—if necessary. What a wonderful job it would have been. It wasn't necessary—but almost.

We're having all kinds of trouble—everywhere. Labor is restless, the railroads are in bad shape, Europe is all askew, many things are wrong, but it is just one big opportunity for the men in the motor transportation business.

We need keen minds, cool heads and men of action. There is no class of men who fit this classification so well as the automotive men. They are used to moving swiftly, acting quickly and keeping cool. To-day we can all render a service

to the country and to all business by studying this situation and taking part in helping keep things straight.

Even the very small town dealer, who has but few truck prospects at best, has farm prospects, and there are many things he can do as well as the big town dealer, if not better.

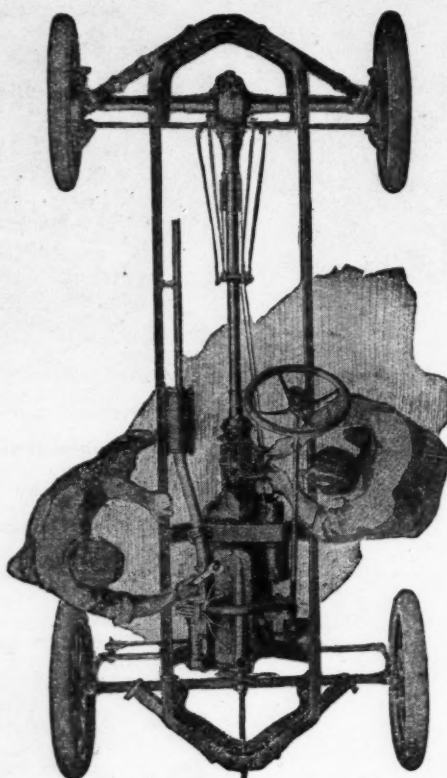
The big point we set out to make is that every man should get his head above the unsettled conditions of to-day and see the truth. The truth is that when the world's greatest need is transportation it is a wonderful opportunity for an industry whose business is manufacturing, selling and maintaining transportation.

And the foundation of the whole thing is the automotive dealer.

And that's you.

# SERVICING THE OVERLAND FOUR

**T**HIS is the fifteenth of a series of articles dealing with the service operations on the Overland Four. The work as it stands has been prepared by the Willys-Overland Co. and the dealer will find at the head of each operation the amount of time required to do the job. The operations have been put down in a step-by-step method so that one operation is logically followed by the next. This makes it possible for the service man to have on hand all the necessary tools and equipment before beginning the job. Incidentally, the time limit set for the job affords a ready means whereby the skill of the mechanic can be judged. Other things being equal it should not take a man longer to do a certain job than herewith mentioned, as the service department of the factory has established these limits after much experimenting. Dealers who are not keeping copies of MOTOR AGE on file are suggested to do so to get the benefits of this series.



## Part XV — Rear System

**T**HESE valuable articles—Servicing the Overland Four—will run serially each week until the service operations on the entire car have been explained. This week deals with the

## Rear System

Keep a file of MOTOR AGE for ready reference. The flat-rate system of estimating on a job has been proved the best plan to make your service work more profitable, eliminate complaints and please your customers. The time given here for each service operation can be adapted to the flat-rate system of estimating cost of repair jobs on cars of this class.

### TO REMOVE AND REPLACE DIFFERENTIAL ASSEMBLY.

Time: 1 hr. 15 min.

- Replace bevel gear and drive pinion, 2 hrs.
- Replace rear axle or rear axle gear, 1 hr. 45 min.
- Replace differential spider or pinions, 1 hr. 30 min.
- Replace differential case (large), 2 hrs.
- Replace differential case (small), 1 hr. 30 min.
- Replace differential bearings, 1 hr.
1. With chain falls or crane, lift weight of car from rear springs.
2. Remove cotter and clevis pins from foot brake rod connected at foot brake pedal.
3. Remove wing adjusting nut holding brake rod to hand brake lever.
4. Remove cotterpins from rear spring bolts at axle end.
5. Remove rear spring bolt nuts.
6. Drive out bolts.
7. Block up under torsion tube and remove rear system.
8. Remove cotter and clevis pins from brake levers at rear axle end.
9. Remove four  $\frac{1}{2}$ -in. nuts and lock washers holding torsion tube to axle housing.
10. Remove torsion tube.
11. Place rear axle assembly of suitable wooden horses and remove wheel hub caps.
12. Pull out cotterpin from rear axle nuts.
13. Remove  $\frac{1}{4}$ -in. rear axle nuts.
14. With wheel puller, remove wheels.
15. Remove rear axle key.
16. Remove drain plug from rear axle housing and drain oil.
17. Remove seven  $\frac{1}{4}$ -in. cap screw nuts and lock washers from rear axle housing, and remove cap screws.
18. Separate rear axle housings and clean up differential assembly. If differential bearings only are to be installed, remove and replace differential bearings with bearing numbers facing differential housing. Begin with operation No. 27 for assembling procedure.
19. Remove locking wire from differential housing cap screw.
20. Remove eight  $\frac{3}{8}$ -in. differential housing cap screws.
21. Separate differential housing.
22. With screw driver, pry out differential spider and pinions.
23. Remove rear axle shafts. If new axle shaft is to be installed, place axle in arbor press and use short tube fitted over end of shaft at gear end—see Fig. 30. Force gear down on shaft and remove split washer. Press gear off of shaft. Remove rear axle gear key.  
To assemble: Put gear key in shaft. Press gear on shaft and incorporate split washer. Press shaft into gear until washer seats in gear.  
To install differential spider or pinions: With differential separated, pry out differential spider and pinion, and assemble pinions on well lubricated spider.  
To remove and replace the bevel drive gear and pinion: Cut rivets holding gear to large differential gear case. Drive out rivets. Install new gear and hot-rivet to differential gear case large. To remove drive pinion: Remove cotter pin from propeller shaft nut and remove nut. Drive off pinion. Remove propeller shaft key. Fit new pinion to propeller shaft taper, making sure that it will fit tightly when drawn up with propeller shaft nut. Remove pinion and install propeller shaft key. Fit pinion on key and taper. Replace propeller shaft nut. Tighten securely and cotterpin.
24. Assemble axle shaft in differential housing.
25. Install spider and pinion assembly.
26. Install left rear axle in differential housing and assemble housing, using eight  $\frac{3}{8}$ -in. cap screws. Draw tightly with socket wrench and lock with wire. If new differential assembly is installed: Assemble annular bearings to differential housings with bearing numbers facing the differential housing.
27. Set differential and axle assembly in rear axle housing with driving gear in left hand housing.
28. Assemble right half rear axle housing.
29. With seven  $\frac{1}{4}$ -in. cap screws, lock washers and nuts, bolt rear axle housing together.
30. Install rear axle shaft keys.
31. Pack rear wheel bearings with grease.



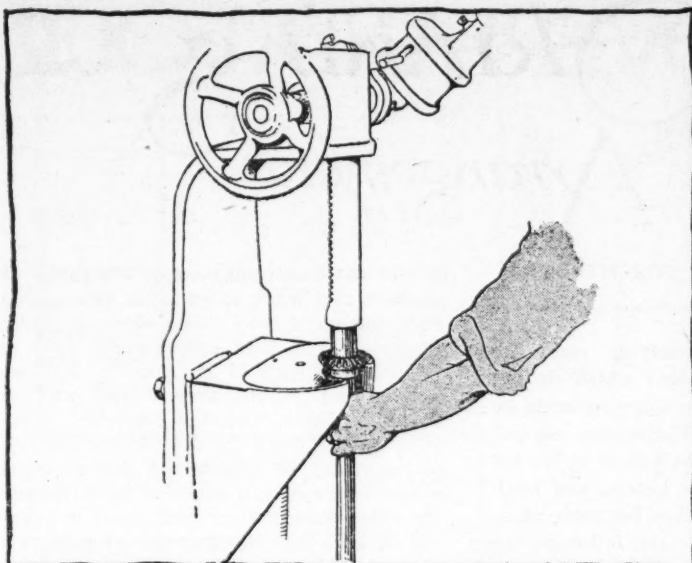


Fig. 30. Pressing pinion off rear axle shaft

32. Install rear wheels.
33. Put on  $\frac{5}{8}$ -in. axle shaft nuts.
34. Cotterpin.
35. Put on wheel hub caps.
36. Assemble torsion tube assembly to rear axle housing with four  $\frac{1}{2}$ -in. lock washers and nuts. Tighten securely.
37. Connect brake rods to rear axle levers with clevis pins.
38. Cotterpin clevis pins.
39. Roll rear system under car—one man steering propeller shaft into universal joint. It may be necessary to place transmission in low gear and hand crank engine to line up universal joint with propeller shaft.
40. Put in left rear spring shackle bolt, nut, and cotterpin.
41. Put in right rear spring bolt, nut, and cotterpin.

42. Replace hand brake rod in hand brake lever connecting with wing adjusting nut.
43. Replace clevis pin connecting brake rod to service brake pedal, and cotterpin.
44. Remove chain falls or crane.

**TO REMOVE AND REPLACE REAR AXLE GREASE****RETAINING WASHER.**

Time: 20 min.

1. Jack up rear axle.
2. Remove rear wheel hub cap.
3. Remove cotterpin from rear axle shaft nut.
4. Remove rear axle shaft nut.
5. With wheel puller, remove wheel.
6. With screw driver, remove steel washer.
7. Remove grease retaining felt washer.
8. Install new felt washer.
9. Install steel retaining washer.
10. See that rear axle shaft key is in position.
11. Put on rear wheel.
12. Install rear axle shaft nut. Tighten securely and cotterpin.
13. Put on hub cap.
14. Remove jack from under axle.

**TO REMOVE AND REPLACE REAR WHEEL BEARING.**

Time: 25 min.

1. Jack up rear axle until wheel is free from floor.
2. Remove hub cap.
3. Remove cotterpin from rear axle shaft nut.
4. Remove rear axle shaft nut.
5. With wheel puller, pull off rear wheel.
6. With puller pull off wheel bearing.
7. Replace rear wheel bearing, packing with grease.
8. See that rear axle shaft key is in proper position.
9. Assemble wheel on shaft.
10. Put on rear axle shaft nut. Tighten securely and cotterpin.
11. Put on hub cap.
12. Remove jack.

## Ferris Safety Coupler Brings the Coupling Units Into Line Automatically by a Guiding Arm

The Ohio Motor Vehicle Co. of Cleveland has secured patents on a new device which eliminates many of the dangers of coupling trailers and trucks. The idea is the outgrowth of long study and experimenting to devise a means of reducing the large number of accidents that are constantly occurring in coupling trailer to truck.

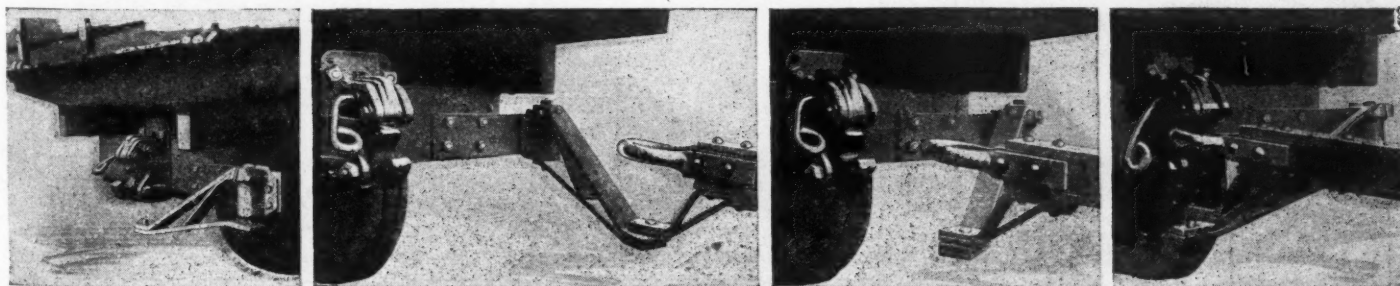
The Ferris safety coupler has a guiding arm which is pivoted on one side of the truck at the rear. This guiding arm is of the proper length so that when it is swung inward toward the center of the truck, it carries whatever is fastened

thereto, directly into the jaws of the truck coupling. In backing up to the trailer, the driver can stop his truck at any point within twenty inches of the correct coupling position, get out and place the trailer hitch link on the guiding arm, return to his seat, throw on the reverse power and the guiding arm brings the coupling units together, where they are automatically locked. As the lock is made, the guiding arm is thrown from the hitch link and is held back out of the way by a tension coil spring.

With the Ferris safety coupler it is

not even necessary to bring the truck and trailer in a direct line before the safety arm connection is made. The device allows sufficient latitude so that any average driver can back his truck without difficulty or waste of time to a position where the safety arm connection can be made easily.

The elimination of the danger element in coupling is, of course, the outstanding feature of this appliance, but in actual use it has been found to be a remarkable time saver and to do away with the necessity of an extra man.



The guiding arm is swung out and attached to the trailer hitch link, the driver then takes his seat and backs the truck and the hitch is made automatically. As the lock is made the guiding arm is thrown from the hitch link and is held back out of the way by a tension coil spring arm

# Garage Planning

## Service Station Arrangements

### No. 225

#### DOUBLING THE PRESENT CAPACITY

We have a garage building 45x74 ft. and wish to build on another 45x75 ft., using one of the old walls. Please publish drawing giving some idea how to build. Am inclosing drawing of old building. We wish to build on the west. With a south front and want a show room and office in front, also driveway.—Gorton Auto & Tractor Co., Gorton, S. D.

You haven't given us an over amount of information so we cannot make a very intelligent layout. Supposing that you want a general garage we have moved the shop to the new part in order to get width enough in the old part to store large cars. The width of the new part is a trifle narrow for anything but small and medium cars.

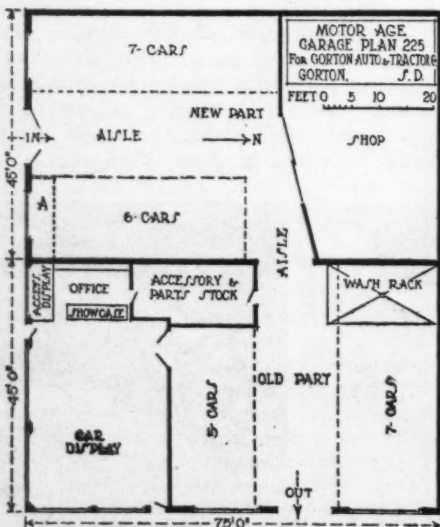
We have placed the show room on the corner as this is probably the most valuable display space. The accessory display window might be extended into the new building as shown at "A" if accessory sales are important enough to warrant.

### No. 226

#### GARAGE AND FRONT ENTRANCE ONLY

We entered the automobile business in Frankfort four months ago, and having outgrown our present garage find it necessary to build, and in this connection thought you might give us some assistance by submitting a set of plans for a good modern garage. However, we would like the cost of same held down as low as possible, as we realize the high prices of building material at present.

We give you on another sheet a rough pencil sketch showing size and shape of plot. You will notice we will have no other outlet except the front, the river being in the rear, and there is a building on each side.



No. 225. Doubling present capacity

### CONDUCTED BY TOM WILDER

MOTOR AGE is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and readers are urged in asking for such plans to be used to include the following information:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

We would like a basement, ground floor, and second floor. The lot slopes so that very little excavating would be necessary for the basement. We would prefer driveway to each floor rather than elevator if possible. Shop and battery repair department on second floor. Wash stand for washing cars in basement. Showroom for about six cars, counter and space for accessories, racks for displaying tires, stockroom for parts, offices, toilets, etc., on main floor. We will employ about ten men in the shop and battery department.

Your desire for a driveway or ramp to the upper and lower floors is not practical with this width of building. It

would cut down your space available for storage and work to such an extent that it would more than offset elevator maintenance. The first construction cost of the elevator would be greater, but we believe you would save money and be better satisfied with the elevator. With your repair shop on the second floor it is necessary to maintain a car or some other device to tow disabled cars up, and the extra time of your men spent in coaxing cars up will run into money very fast these days.

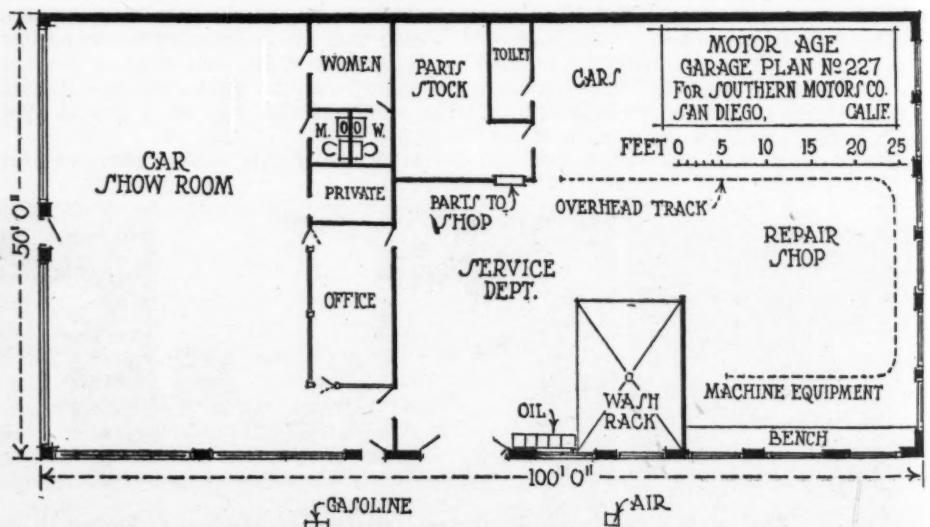
As it is the driveway cuts off so much of your frontage that it will be hard to get cars in and out of your showroom except with shed jacks although we have allowed 8 ft. per car. You will note also that the stockroom is small and it might be well to have a second floor stockroom for parts at "A." A dumb waiter or some sort of basket device operated by one of the battery assistants would get things down to the salesroom quickly.

We suggest that you use the central part of the second floor for a paint shop in which case the folding doors should be moved to the other side of the elevator so that the elevator would open into the shop rather than the paint shop.

### No. 227

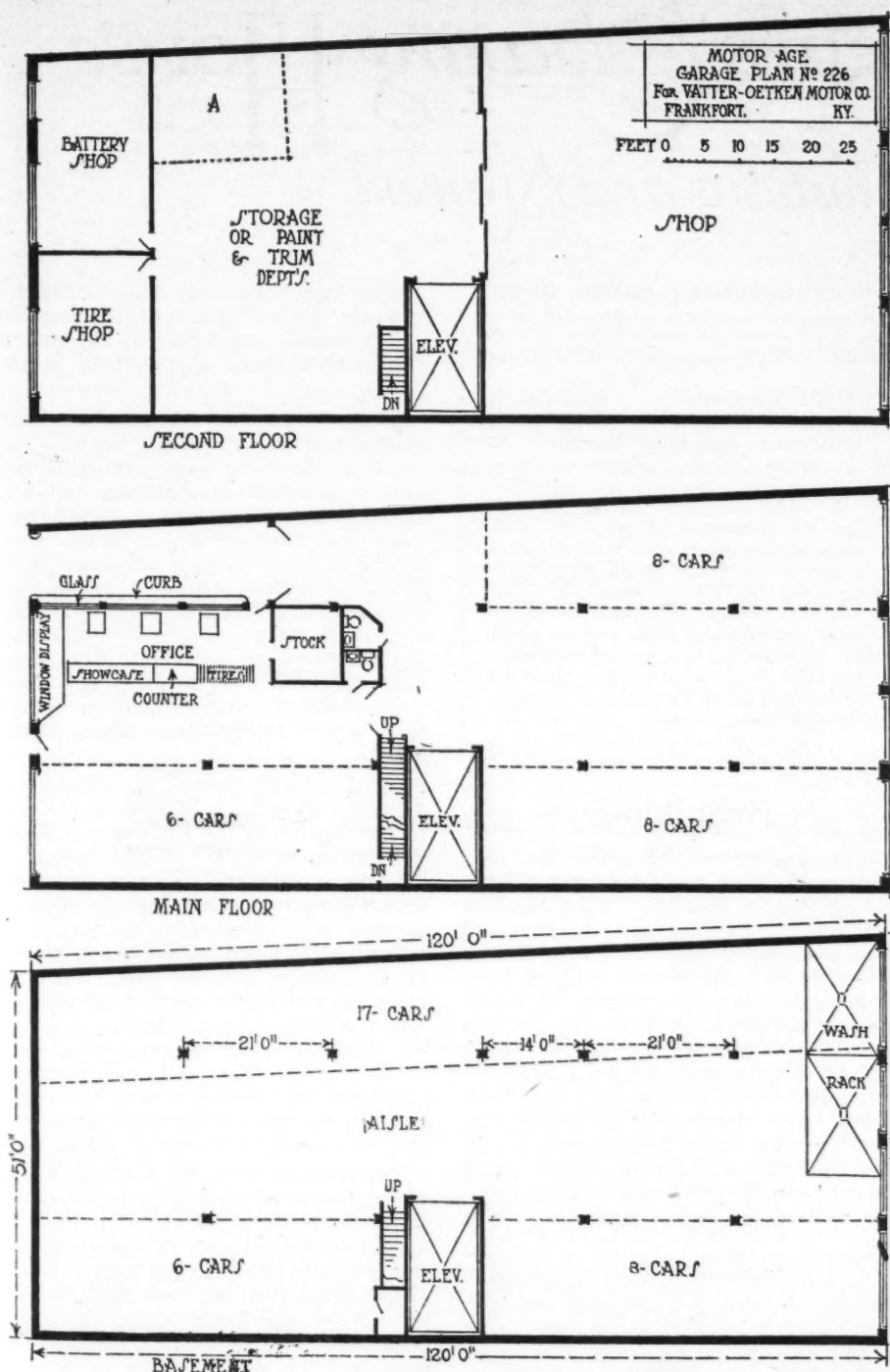
#### A SIMPLE SALES AND SERVICE LAYOUT

Would you please be good enough to furnish us with plans for a one-story sales and service station to be erected on a corner lot in the heart of the automobile district in this city. The building to be 50 by 100 ft. We will render service to Scripps-Booth owners only, and carry parts and accessories for our customers. The salesroom to be large enough to exhibit four cars. We will have four mechanics at the most in the service station.—Southern Motors Co., San Diego, Cal.



No. 227. A simple sales and service layout





No. 226. Garage with front entrance only

Next to a sales room or service station only, the simple sales and service station is the easiest to plan. The corner location makes it especially easy since there is no conflict between the two departments. The showroom may be given plenty of frontage in which to display cars, while the side entrance makes the shop accessible without cutting down frontage for a driveway or in any way interfering with the business of sales.

This arrangement of the repair shop is good because it is flexible. The machine equipment has good light and is so placed that it is convenient though well out of the way. The outer part may be used for storage when service business is light.

## Staggered Ramp Construction Patented

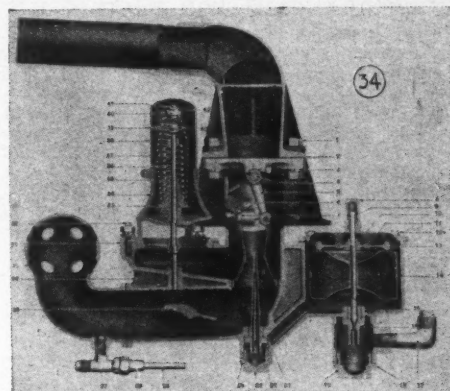
In the March 11 issue of *MOTOR AGE* there appeared an article describing a garage, having as its chief feature of construction, a staggered floor plan connected by ramps. Patent rights on this type of ramp were granted F. E. d'Humy, New York, March 25, 1919, No. 1,298,183.

A company is being organized for the purpose of erecting a chain of garages throughout the United States, using this staggered floor plan, and to license others who may wish to use this type of ramp construction.

## Adjusting the Carbureter

(Concluded from page 37)

in the most severe climatic changes, otherwise it should be left strictly alone. If the mixture is desired richer, then the tension on the spring should be increased, but if greater economy is desired then the tension should be decreased slightly. The effect of this is to control the amount of auxiliary air en-



The Packard carburetor

tering. With a tight spring, little air will be admitted and the primary air alone will then produce a rich mixture. The adjustment is controlled by the two nuts, 41 and 42, shown in Fig. 34. The stop arm adjustment which controls the extent of minimum opening of the throttle is designed as 6 in the illustration.

## PARTS CONCERN ENLARGES

Columbus, O., May 24—The Columbus Auto Parts Co., which operates a large factory at 215 East Russell St., has purchased a lot adjacent to the present factory upon which it is planned to erect a large addition to the plant. At the same time the authorized capital of the concern was increased from \$150,000 to \$300,000 to provide for the addition and also for new equipment. The concern makes a varied line of automobile supplies and accessories. Charles J. Krag is president, A. J. Pembroke and J. J. Stottgart, vice-president and R. E. Klages, secretary-treasurer.

## CITY BUYS OWN EQUIPMENT

Wilmington, Del., May 25—Having found it difficult to meet the demands of local teamsters and truck owners engaged in removing ashes, waste, etc., for the city, the street and sewer commissioners have decided to provide their own motor equipment. As a starter they have ordered three five-ton trucks from the White Co.

The department has a great deal of need for hauling equipment, but up to the present time has found it cheaper to hire the work done. Now, however, the rates, particularly on the part of teamsters, have gone up to such an extent that the department believes it can save money by having its own equipment. For a long time it has owned and operated its own sprinklers, all of which are now motorized.

# The Readers' Clearing House

## Questions and Answers

### CHALMERS FOR RACING

—A Model 35-A six-cylinder Chalmers with a hp. of 25-35, a wheel base of 117 in. and bore and stroke of  $2\frac{1}{4}$  by  $4\frac{1}{2}$  in. is to be entered in a race very shortly. The race is to be run on a half-mile dirt track very slightly banked. The axle gearing of this car is now  $4\frac{1}{2}$  to 1. Do you think that is too low or too high for a half-mile track? The carburetor used on the car is a Stromberg. If there is any other information you could give as to tuning up the engine, etc., it will be appreciated.—C. Appelbe, Winnipeg, Manitoba, Canada.

On a half-mile track you will get better pick-up and more speed using a 3 to 1 gear ratio. Advance the valve timing slightly. The installation of light pistons and connecting rods will aid a great deal in getting greater speed. We advise selecting a carburetor designed for racing purposes.

### PEUGEOT

Q—Publish picture of the Peugeot that won last year's Indianapolis race.

2—What is the address of the Peugeot company?—Robert Clark, Springfield, Mo.

1—See Fig. 1.

2—The address of the company making the Peugeot car is Societe Anonyme des Cycles et Automobiles, 71 et 73 avenue de la Grande-Armée, Paris.

### REBUILDING HUDSON SUPER SIX

Q—Instruct how to cut down a Hudson super-six to an extremely fast racer. Show how front wheel brakes may be applied. What should be done to engine to speed it up, sparing no expense whatever? Would drilling holes in frame to lighten same be wise?—Frank C. Perry, Detroit.

It will be necessary to strip the car of

### CONDUCTED BY ROY E. BERG

Technical Editor—Motor Age

**T**his Department is conducted to assist Dealers, Service Stations, Garagemen and their Mechanics in the solution of their repair and service problems.

In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been asked by some one else and there are answered by reference to previous issues. MOTOR AGE reserves the right to answer the query by personal letter or through these columns.

### Rebuilding

its present body, underslinging the rear springs to lower the frame, using long, flat springs, if possible. Then lay two sills made to fit the frame members and floor over with substantial oak boards. A couple of bucket seats will be easy to find and a large gas tank to be placed back of the seats. If you wish you can build a cowl of sheet steel to any form desired, and for this design you can consult many of the designs that have been published in MOTOR AGE. Of course, the steering post must be dropped to fit your needs. A hand pressure pump should be installed to be easily operative and to force oil to the crankcase.

Such unnecessary articles as fenders, running boards, etc., will be removed, and a screen can be fitted in front of the radiator for protection from stones, etc.

There is no doubt that front wheel brakes will prove effective, but few racing cars use them; generally if the rear brakes are kept in condition and well adjusted they will suffice. It will be a good deal cheaper to buy front wheel brakes than to attempt to make them. In San Francisco a concern makes what is known as a hydraulic brake, and fits it to the front wheel as well as the rear. We believe if you will write E. F. Chefins, 1628 Van Ness avenue, San Francisco, Calif., he will be able to furnish you with information about these brakes.

By no means would we recommend drilling holes in the frame of the car. In the first place the little weight saved will not make up for the weakening of the frame. This applies also to the front axle, for while it is a somewhat common practice it is a dangerous one.

Your chief work will come in tuning up the engine and this calls for carefully balancing the connecting rod assemblies, lining up bearings and scraping them to a delicate fit, adding some form of ring that will give absolute maximum of compression. You might be able to get a little faster camshaft and thus improve the valve action.

The Hudson company will be able to advise you as to the gear ratio you ought to use and you ought to bring this car up to do better than 100 m.p.h. If you can communicate with Ira Vail, care the Philbrin Ignition Co., New York, we believe it will be worth while, as he has been successful in making fast Hudson cars.

### SUGGESTED WRECKER DESIGN

Q—Recently started an exclusive towing service and intend to equip either a two- or three-ton White truck as a wrecker. Publish suggestions. My idea was to equip the truck with a power driven vertical capstan winch and a large crane.—Frank R. Murtha, Utility Motor Service, Seattle, Wash.

A special truck design is shown in Fig. 2.

### GARAGE WAGON BODY

Q—Publish suggestion for garage wagon body to be mounted on a Chevrolet 4-90 chassis.—A. G. McMann, Chevrolet Distributor, Davenport, Ia.

Shown in Fig. 3.

### REBUILDING A LOZIER

Q—Publish a speedster design for a 1916 6-cylinder Lozier.

2—If tires were changed from  $36 \times 4\frac{1}{2}$  to  $33 \times 4\frac{1}{2}$ , what would be the difference in road clearance and speed?

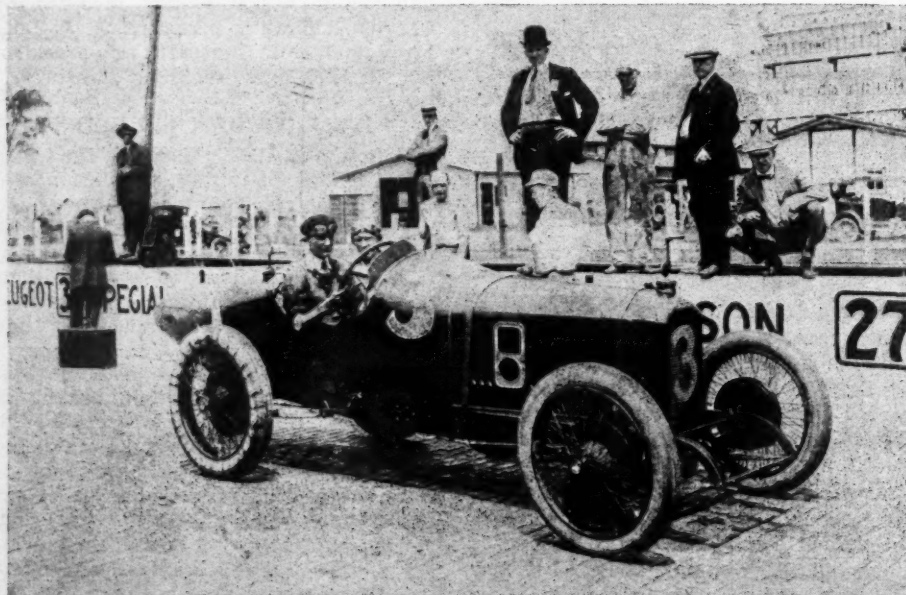


Fig. 1. Howard Wilcox in Peugeot that won last year's Indianapolis race



3—What speed can this car attain when in first class condition?

4—Give address of the Lozier company and where parts for this car can be purchased.—H. T. Hawkins, Chicago, Ill.

1—Shown in Fig. 4.

2—If this change is made the road clearance will be about  $1\frac{1}{2}$  in. less than it is at present. Using the smaller sized wheel the maximum speed obtainable will be 3 or 4 m.p.h. less than with the 36-in. wheel.

3—This car should attain a maximum speed of about 60 m.p.h.

4—This car is no longer in production. Parts may be obtained from the following companies: Jos. C. Gorey & Co., 354 W. 50th street, New York; Lozier Motor Car Co., Fourth and Sixth streets, Detroit, Mich., and the Puritan Machine Co., 422 Lafayette boulevard, Detroit, Mich.

### FRICTION DRIVE

Q—Publish sketch of light car driven by a friction drive. Explain how to fasten the springs to the axles, show how to fasten the engine to the frame, how the steering gear, brakes and radius rods, if any are needed, should be fastened.—E. L. Beebe, Jackson, Mich.

The illustration which is shown in Fig. 5, we think, is self-explanatory.

### INCREASING SPEED

Q—Instruct how to increase the speed of a 1920 Auburn 6-39 to 65 or 70 m.p.h. without any changes on engine.

2—Where can parts be secured.

3—What speed would a 4 to 1 gear ratio make.

4—What gear ratio would be required to secure 65 m.p.h. — Claude DeJean, Dusen, La.

1—More speed can be obtained by changing the gear ratio, but power and acceleration will have to be sacrificed.

2—The gears can be purchased from the following companies: Wm. Ganschow Co., 1001 Washington Blvd., Chicago; Indianapolis Tool Mfg. Co., Indianapolis, Ind.

3—With a 4 to 1 gear ratio you ought to get a speed of approximately 60 m.p.h.

4—3 to 1.

## Miscellaneous

### UNIVERSAL JOINT TROUBLE

Q—The driveshaft housing on a 1917 Buick 4 comes loose where it is screwed to the differential housing. It has so much strain on it that at times it strips the threads on the screws. Would it be possible to cut the driveshaft casting and place another universal joint in the drive shaft near the differential? Would this be the easiest way to remedy the trouble?

TO help readers in obtaining as a unit all information on a certain subject MOTOR AGE segregates inquiries in this department into divisions of allied nature. Questions pertaining to engines are answered under that head and so on.

### REBUILDING

C. Applebe.....Winipeg, Man., Can.  
Robert Clark.....Springfield, Mo.  
Frank C. Perry.....Detroit  
Frank R. Murtha, Utility Motor Service.....Seattle, Wash.  
A. G. McMann, Chevrolet Distributor.....Davenport, La.  
H. T. Hawkins.....Chicago  
E. L. Beebe.....Jackson, Mich.  
Claude DeJean.....Dusen, La.

### MISCELLANEOUS

Lowell Blosser.....Nappanee, Ind.  
Harry G. Debin, London Garage.....  
W. L. McAlexander.....Gainesville, Fla.

### CARBURETION

C. J. Thompson.....Almena, Kans.  
H. R. Warfield.....Crockett, Tex.  
Roy E. Spellman.....Martell, Nebr.

### ENGINES

Clayton L. Cooper.....Hanover, Ill.  
O. C. Lindsay.....Marcus, Ind.  
D. V. Russell.....Laona, Wis.  
Alex McBeath.....Washoe, Mont.  
Roy E. Spellman.....Martell, Nebr.  
Mickle Guthrie.....Spiro, Okla.  
D. C. Kiseil, Jr.....Buffalo, Wyo.  
H. E. Clark, Illinois Motor Sales Co.....Peoria, Ill.

### LUBRICATION

J. H. Jensen.....Woonsocket, S. D.  
Albin Swedlund.....Kirkhaven, Minn.  
C. B. Roy.....Lafayette, La.  
B. J. Clark, Clark and Nagle, Electric Shop.....Waterloo, Ia.  
Wm. Anderson.....LaCase, Texas

### THE ELECTRIC SYSTEM

Hugh L. Russell.....Eaceton, Arizona  
A. W. Ohland.....Biscay, Minn.  
Walter Dodge.....Newton, Kans.  
J. H. Jensen.....Woonsocket, S. D.  
R. A. Quinby.....Dayton, Ohio  
The Hildebrand Motor Co.....St. Matthews, S. C.  
Everitt Gibbs.....Winchester, Ill.  
Roy E. Spellman.....Marshall, Neb.

What kind of universal joint would you recommend, and how should it be installed? —W. L. McAlexander, Gainesville, Fla.

This trouble is not general and there is no reason why the design should be changed to overcome it. It seems very logical to assume that the trouble is in the universal joint. The transmission in this car is set solidly to the car frame, but the rear axle is hung on springs and must be free to follow the uneven surface of the road. In order to allow continuous transmission of power from the gearset to the rear wheels, the universal joint is interposed between them. It consists, essentially, of a split ring and two yokes, each of which has two bearings in the ring. The forward yoke is connected to the main shaft of the gearset and the rear one to the pinion shaft of the rear axle. The arrangement of

the yokes is such that the two shafts may be bent at an angle to each other without interrupting the turning effort. If the bearings in the rings are badly worn it is logical that there will be a twisting action that will work on the screws that hold the housing and it might also create the effect of a tendency of the shaft to pull away from the rear end.

### TIRE SIZES

Q—Could a 35 by 5 tire be put on a 32 by  $3\frac{1}{2}$  rim? If so, then a 34 by  $4\frac{1}{2}$  tire could be put on a 33 by 4 rim?

2—Publish list of oversizes for regular size tires.—Lowell Blosser, Nappanee, Ind.

1—The inside diameter of a 35 by 5 in. tire is 25 in., and of a 32 by  $3\frac{1}{2}$  in., the same. Now if the large tire is not too stiff to be applied to the small rim it will work very satisfactorily. We doubt very much whether a cord tire will work, but feel that a fabric tire will work.

2—The general rule for oversized tires is to subtract two times tire width from the tire diameter which gives the inside diameter of the tire. Then if the inside diameters are the same the two tires are interchangeable.

### CLUTCH RELEASE

Q—New rebuilt clutch refuses to release for low gear without jamming the gear. There does not appear to be any clutch break on car and plates have been loosened up to slipping point.—Harry G. Debin, London Garage, Los Angeles, Calif.

From the description given we are inclined to believe that the trouble is not in the clutch but in the clutch linkage. In taking the clutch down it is quite likely that the shifter fork has been changed somewhat in order to get the clutch out. If the fork is out of alignment with respect to its proper relationship to the clutch it will result in the same effect as if the clutch was not releasing. The fact that everything works correctly when the shifts in intermediate and high indicates that this shifter fork is functioning properly and the clutch is all right.

## Carburetion

### CARBURETER CHANGE

Q—Would the installation of a Stromberg carburetor increase the mileage per gallon of gas on a 1914 Oakland Model 36 fitted with a Schebler model B carburetor? Present mileage only 10 miles per gallon.—C. J. Thompson, Almena, Kans.

We are not in a position to recommend any particular make of carburetor but there is no question but what a new car-

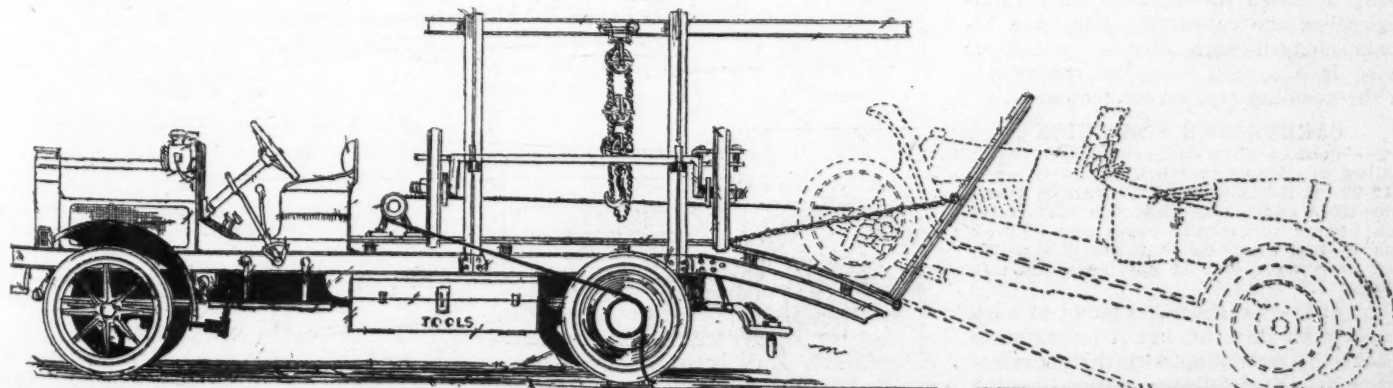


Fig. 2. Suggested scheme for converting a 3-ton White truck into a service and floating rig

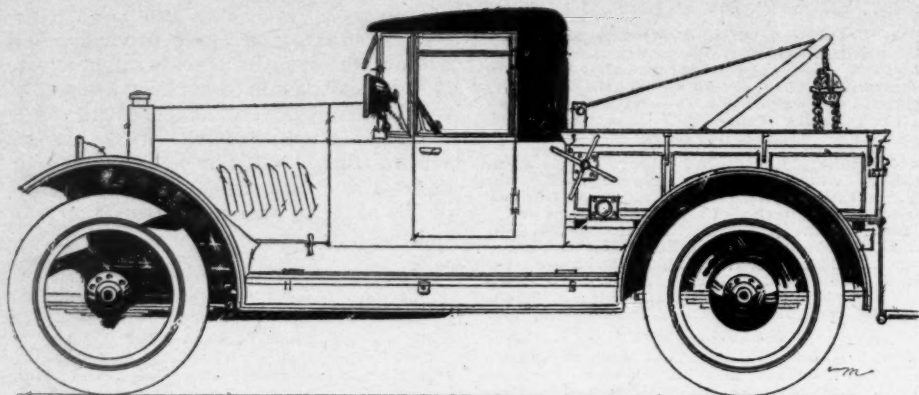


Fig. 3. A small service wagon converted from a Chevrolet chassis

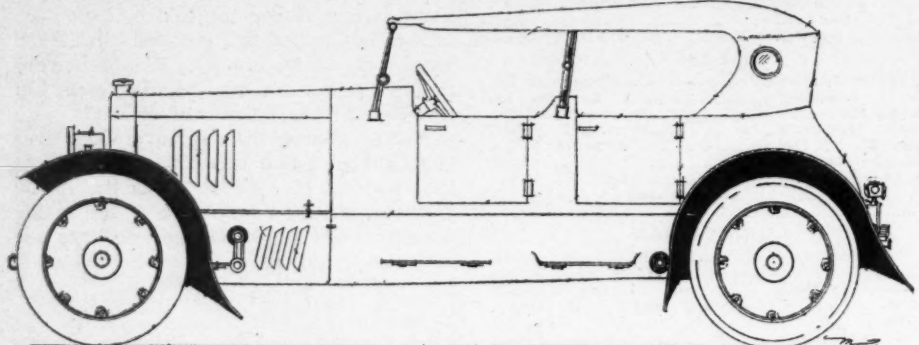


Fig. 4. Special body design with individual fenders for 1916 Lozier chassis

bureter should be installed to meet with the condition of fuel at the present time. Many advances in carbureter design have been made since 1914 and of course all of the companies are making very similar claims for their products. You will therefore have to make your selection upon a comparison of the claims of the various manufacturers.

#### CARBURETER SPITS

Q—A very bad "spit" through the carbureter has been developed in a Hupp Model K when the engine is pulling on even a slight grade in high gear. The timing and ignition have been checked and the valves have been ground. The trouble seems to have ceased, except for an occasional spit on a hard pull in high gear. Have heard that this is a common trouble with old Hupps.—H. R. Warfield, Crockett, Tex.

There is no question but what carbureters of recent design are better able to handle the fuel of the present time. This missing may be caused by the spark plug gap being too wide, incorrect of carbureter air regulating lever, or too lean a mixture. If the engine misses with a popping noise in the carbureter, indications are that too much cold air is being admitted through the air regulating valve, the carbureter jets have become clogged with dirt or water, or there is a partial stoppage somewhere in the gasoline pipe or connections.

#### CARBURETER FOR BUICK

Q—Would a Ford carbureter such as the Holley or Kingston work properly on a 1912 28 hp. Buick Four, if the intake manifold were cut off so that the carbureter was nearer the intake ports and if tank was high enough so that the gas would feed properly?—Roy E. Spellman, Martell, Nebr.

Any of these carbureters ought to work properly on this car, but it is advisable to take the matter up with the manufacturers of the carbureters before making the installation.

## Engines

### OVERHEATING

Q—What makes the water in a Ford radiator boil excessively when there seems to be no cause for it? The original Ford radiator was frozen and burst, so that it was necessary to install a new radiator. Before the new radiator was installed the engine was thoroughly overhauled. New piston rings were put in, bearings tightened, valves refaced and resealed and ground, carbon cleaned out, etc. Then a new Perflex honeycomb type of radiator was installed and the car tested out. It starts easily, runs smooth and quietly and has more power and speed than the average Ford, but the water in the radiator boils inside of two miles when running on high on good roads. The engine is not out of time, the circulation does not seem to be obstructed in any way and we have tried driving with the spark in every notch of the radius of control. Can you suggest any possible cause for this undue heating? The car is a 1918 model touring car and was formerly the best of our

Fords. It does not overheat enough on long runs to injure the engine seriously. Can it be possible that this honeycomb radiator is not right for a Ford?—Clayton L. Cooper, Hanover, Ill.

See that the fan belt is not slipping. Perhaps bending the fan blades to obtain a greater flow of air will help. Insufficient lubrication may also cause overheating. Make a thorough examination of the carbureter to see that the engine is not running on too rich a mixture. The spark plugs may be dirty or the gap at the points too large. The magnets may be too weak, with poor ignition as a result. The radiator you installed is designed for Ford cars, and we see no reason why it should not work satisfactorily.

### OVERHEATING

Q—The engine on a 1916 Dodge overheats in a short time on a warm day. Give the cause and remedy.—C. C. Lindsay, Marcus, Ia.

Overheating may be caused by a great many things, and of course it is obvious that it is impossible to make any positive statements. The exhaust valves may not open early enough to let the burnt gas out; the engine may be running on too rich a mixture; the spark may be retarded too far; there may be lack of lubrication; the water may not be circulating properly, due to clogging of the water passages or circulation pump not working properly; carbon deposit will also cause overheating; the brakes may be dragging, which cause a heavy load on the engine.

### CYLINDER TYPES

Q—Is the Argo car still made? If not, where can repair parts be obtained?

2—Why does the Buick retain the solid cylinder head instead of adopting the removable head?—D. V. Russell, Laona, Wis.

1—The Argo car is out of the motor car field. Parts can be obtained from the Puritan Machine Co., Detroit, Mich.

2—We cannot state why the Buick company has not adopted the removable cylinder head. It is evident that the designers of the engine have reasons for using this type of cylinder.

### WORN TRANSMISSION BEARINGS

Q—What is the weight of the Overland Model 85-4?

2—In shifting the low gear to second gear the gears stuck fast and remained so

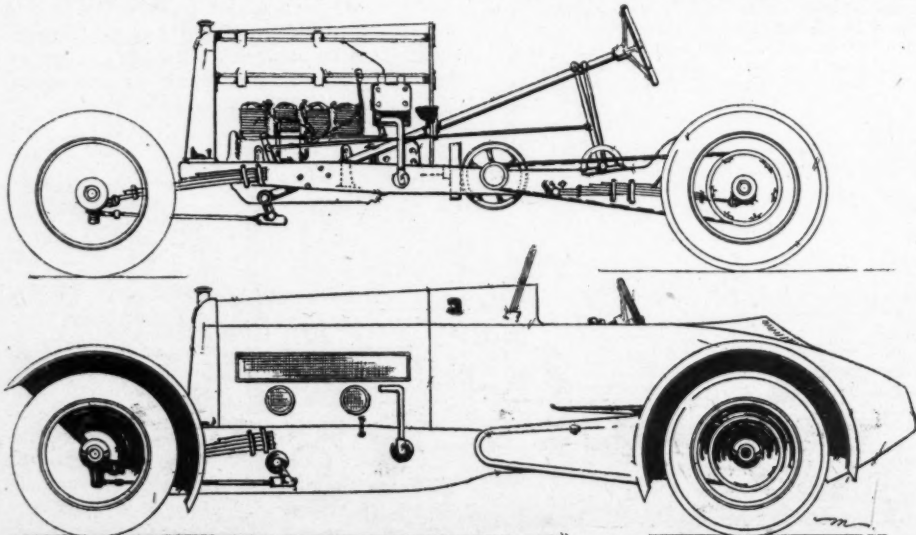


Fig. 5. Design of light car with friction drive



until forced apart with a screw driver. What would cause this and how can it be remedied?

3—Should there be a humming sound from the transmission and differential gears of the 1917 Overland Model 90 when running about 15 m.p.h. on second gear?—Alex McBeath, Washoe, Mont.

1—We have no information as to the weight of the Overland model mentioned.

2—This may be due to the teeth of the shifting gears being worn or considerable wear in the bearings which would throw the shaft out of line. It may also be due to a sticking or dragging clutch caused by heavy oil. The remedy is to make an examination to determine the trouble and then make the proper adjustment.

3—There will be a certain amount of hum, but it should not be extremely loud. If extremely noisy the transmission bearings are probably worn.

### WORN TIMING GEARS

Q—When traveling over 25 m.p.h. a 1915 Ford has a knock. Under that speed it runs quiet. The bearings are all tight, but the timing gears are worn. The crankshaft was out of line, but it has been lined up. Is it possible that the crankshaft has sprung back? Straightening did not help the knock any.—Roy E. Spellman, Martell, Nebr.

The noise is probably due to back lash in the timing gears. If they are badly worn a very decided knock will develop. This knock may also be a result of loose camshaft bearings.

### TAPPING NOISE

Q—There is a tapping sound in the pump shaft of a Hudson super six. It seems to come from the clutch end of the generator. Have installed a new pumpshaft bearing and the clutch seems all right. But the tapping sound does not disappear. Give remedy.—Mickle Guthrie, Spiro, Okla.

It is very likely caused by worn generator bearings. They should be examined carefully and the clearance measured, for if they are allowed to wear too far the armature will drop down and destroy the windings.

### GEAR RATIO

Q—Is it possible to put a Ford 3 to 1 gear in a Chevrolet Model 490?

2—If this could be done satisfactorily, would the 3 to 1 gears in a Chevrolet 490 give more speed? If so, give your estimate of the number of miles per hour that could be obtained.—D. C. Kisell, Jr., Buffalo, Wyo.

1—Yes.

2—The present gear ratio of the Chevrolet is 3.67 to 1. Changing to 3 to 1 ought to give a speed of about 55 to 60 m.p.h. if no other changes except gear ratio are made.

### KNIGHT ENGINE

Q—Can aluminum pistons be used in a Stearns-Knight sleeve valve engine to any advantage for speed work, or is it impossible to use them at all in an engine of this type?

2—I have heard of brass sleeves being used for this type of engine. If there are such, what is the advantage in using them?

3—Do you know of any firm manufacturing camshafts and faster sleeves for speed work?

4—Is it possible to obtain pinion and ring gear of a higher ratio for this engine, and if so, where?—H. E. Clark, care Illinois Motor Sales Co., Peoria, Ill.

1—Aluminum pistons were used in the

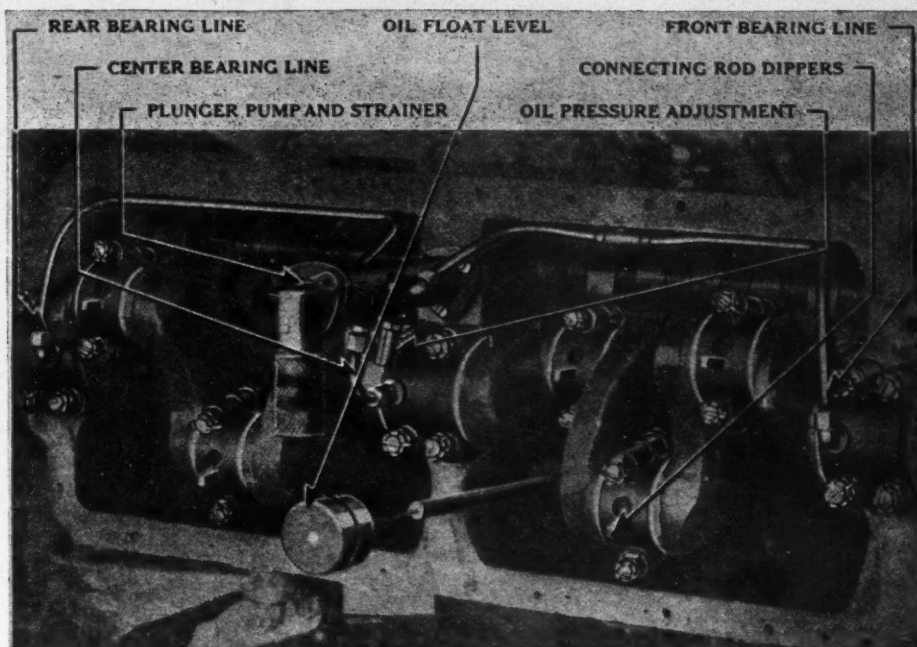


Fig. 6. An underview of the Paige Detroit Continental engine showing the oil pressure adjustment

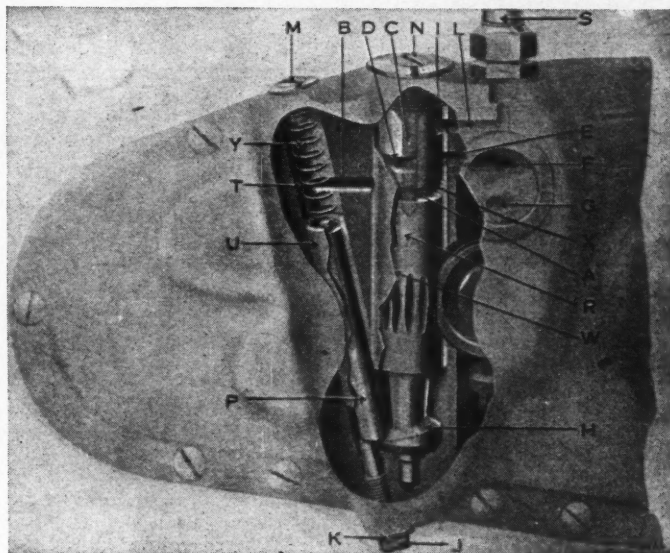


Fig. 7. Sectional view of Harley Davidson oil pump showing the pressure regulation screw

Moline Knight and so far as we know the R & V Knight also uses aluminum pistons. Light reciprocating parts are a very desirable feature for high speed.

2—We have no information regarding the use of brass sleeves in a Knight engine, but there are no engines using brass sleeves at the present time, to our knowledge.

3—Any company that manufactures camshafts can probably build one to order.

4—A set of gears to get a higher gear ratio can probably be obtained from the Stearns factory, but if not the gears will have to be made by a special gear cutting firm or some machine company.

## Lubrication

### OIL PRESSURE REGULATION

Q—Explain how to adjust the oil pump on a 1919 6-39 Paige so it will pump with more pressure.—J. H. Jenson, Woonsocket, S. D.

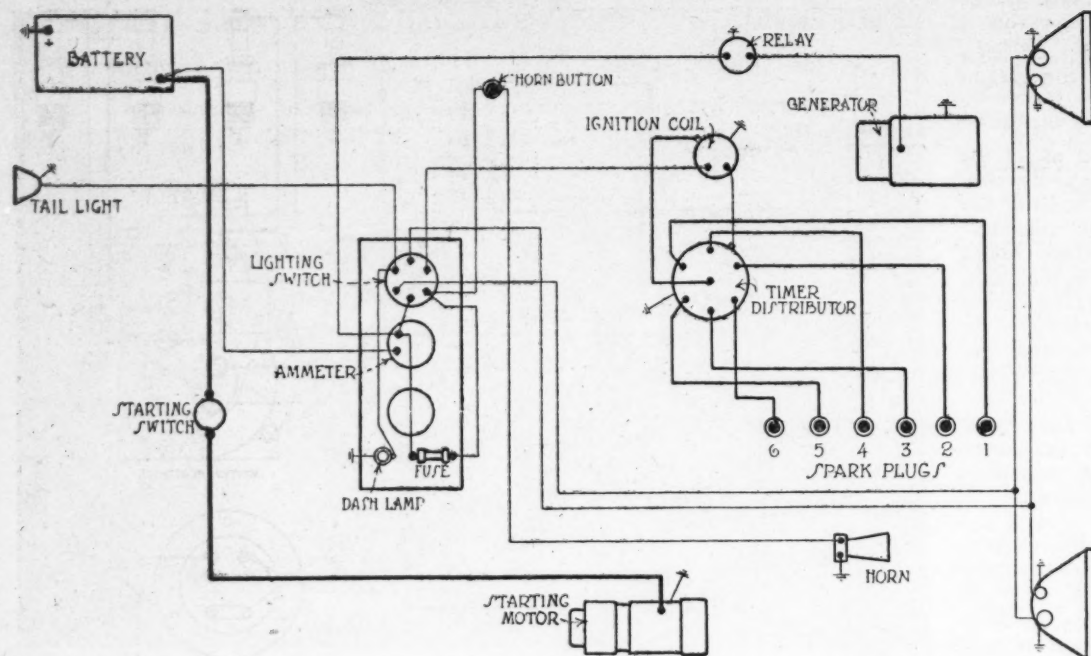
The oil pressure is regulated by an adjustment on the side of the oil pump. It is necessary to remove the oil pan to get at the pump adjustment, as shown in Fig. 6. Screw the plunger rod in or out, which will shorten or lengthen the

stroke and regulate the flow, the longer the stroke the more oil pumped.

### OIL PUMP ADJUSTMENT

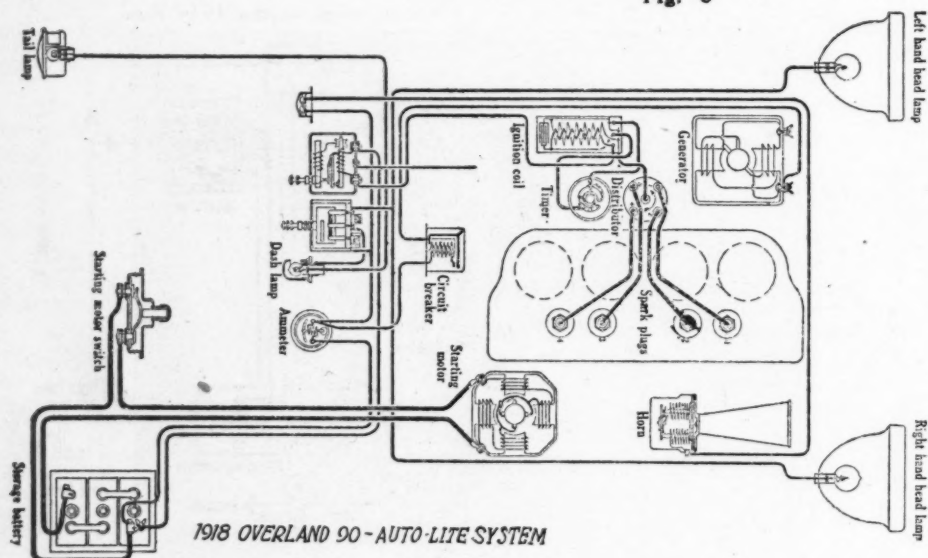
Q—Explain how to adjust the oil pump on a 1918 two-cylinder Harley Davidson motorcycle.—Albin Swedlund, Kerkhaven, Minn.

The factory adjustment provides 720 miles to the gallon of oil. If it is found that a different adjustment is needed



1917 GRANT K WAGNER ELEC. REMY IGNITION

Fig. 8



1918 OVERLAND 90-AUTO-LITE SYSTEM

Fig. 9

proceed as follows: The number of thicknesses of washers at the position K, Fig. 7, determines the amount of oil supplied. The number of washers varies, depending on the amount required to give the plunger  $\frac{1}{4}$  in. stroke. If it is desired to decrease the oil supply remove one thin washer. The adjusting screw "J" regulates the stroke of the oil pump plunger and should be securely tightened after adjusting. When all the washers have been removed the plunger has no stroke, and nothing can be gained by counterboring the cover or adding to the length of the screw.

The factory supplies two thin washers, each .013 in. thick and two washers each .065 in. thick. To increase the oil supply, add one of the thin washers at a time to the standard washers with which the machine comes from the factory, until the proper oil supply is obtained. Be very careful not to reduce the oil supply below the safety margin. It is better

to feed a trifle too much oil than to run the chance of underoiling, but an absolutely correct adjustment can be made and should be.

#### STEPHENS OILING SYSTEM

Q—Describe the oiling system in the New Stephens Salient Six.—C. B. Roy, Lafayette, La.

The details of the Stephens oiling system are given in the May 13 issue of MOTOR AGE.

#### LUBRICATION SYSTEM

Q—Explain the engine lubricating system on the 1913 Michigan Model S roadster.—B. J. Clark, Clark and Nagle, Electric Shop, Waterloo, Ia.

This car is lubricated by what is known as the constant splash system. The bottom of the crankcase is filled with oil, into which the ends of the connecting rods dip, splashing oil all over the interior of the engine and lubricating every part thoroughly. The oil level in the crankcase is regulated by overflow

holes which open into the oil reservoir below. From the reservoir fresh oil is continually supplied to the crankcase by a pump. Passing from the pump to the crankcase the oil goes directly to main bearing, thence to oil pan.

The transmission gears run in a bath of oil contained in their casing. Universal joints are packed in grease and so are differential gears.

Other working parts are lubricated by means of grease cups, oil cups or oil holes.

Keep enough oil in the reservoir so that the quantity registered on the oil gage is between high and low points. Oil is poured into crankcase through the breather pipe. The reservoir holds eight quarts.

#### OILING TROUBLE

Q—The transmission oil on a Pilot Six 45, flows from the transmission to the clutch and then gets into the starter, causing it to clog up and making it necessary to crank the engine by hand. Give remedy.—Wm. Anderson, LaCasa, Texas.

We give you this information supposing that you are absolutely certain that the oil which is leaking out is coming from the transmission. In all probabilities the felt wick packing which goes in the rear end of the main drive gear in the transmission has no doubt been left out or has been pulled back and is permitting the grease to flow through this hole out into the clutch throwout collar and from this point out around the flywheel into the starting motor.

It is not necessary to take down the transmission to remedy this. Remove the front universal joint from the flange, which is keyed to the splined of main drive shaft in the transmission, then loosen the cap around the rear end of the splined shaft on the transmission. This will permit pulling the splined shaft out of the main drive gear and will permit the inserting of a new wick into the main drive gear to overcome this trouble.

We also suggest that you examine the grease that is leaking to make sure whether it is 600 W, the type of grease used in the transmission or engine oil like that used in the engine. Should you find that the grease is really coming from the engine, this no doubt can be remedied by shipping you a new wick to apply to the rear end of the crankshaft.

To do this it will, of course, be necessary to remove the transmission and take off the clutch so that you can get to the pocket in the flywheel which carries the transmission main drive gear shaft and there you will find the hole drilled into the rear journal of the crankshaft. This must be packed with a wick to prevent



## GRANT WIRING DIAGRAM

Q—What make and model carburetor would you recommend for a 1917 Grant Six?

2—Was the Allis-Chalmers genemotor standard equipment on this car?

3—Publish a wiring diagram of this car.—Walter Dodge, Newton, Kans.

1—We are in no position to recommend any specified make of carburetor.

2—Yes.

3—Diagram of the Wagner electric system and Remy ignition of the 1917 Grant is shown in Fig. 8. The Allis-Chalmers system was standard equipment on the 1916 Grant.

## AMMETER INSTALLATION

Q—Instruct how to install a Roller-Smith ammeter on a B 5 R Saxon roadster.

2—The generator on this car charges only about 2 amperes. Is the generator fitted with an adjustment for increasing and decreasing the voltage similar to the Gray & Davis generator used on the 1917 Paige?—J. H. Jensen, Woonsocket, S. D.

1—Diagram showing where to connect the ammeter is given in Fig. 11 and we think it is self-explanatory.

2—This system has third brush regulation and it is adjusted similar, the same as any third brush system, explanations of which have appeared in very recent issues of MOTOR AGE. This low charging rate may be due to poor brush contact which may be from a dirty commutator from poor brush spring action or worn brushes.

## HUPMOBILE WIRING DIAGRAM

Q—Publish the wiring diagram of the 1916 four-cylinder Hupmobile. — R. A. Quinby, Dayton, Ohio.

Fig. 12 shows the Bijur system used on the 1916 Hupmobile.

## STARTER TROUBLE

Q—We have a Delco starter and generator which does not work properly. The batteries will turn the motor as fast as is necessary before the ignition is turned on, but as soon as the ignition is turned on the motor will barely turn. It acts as if it is pulling against itself. New brushes have been installed throughout the starter and generator, and the ammeter shows charge when the engine is running. Can you explain what causes the trouble?—The Hildebrand Motor Co., St. Matthews, S. C.

This trouble may be due to a weak storage battery, switch contacts defective, sticking clutch, armature shaft out of alignment, generator bearings defective, generator brushes not making good contact, loose, dirty connections, ground or short circuit. If the battery is found all right, proceed to examine all connections, beginning with the battery. If the terminals are sulphated, scrape off the sulphate and wash all of the surrounding parts with carbonate of soda or some other alkali. Examine the connection of battery to frame. Then connections from battery to starting motor. Be sure that the starting switch contacts are in good working order. See that the commutator is clean and the brushes are making good contact. The brush springs may be weak or not functioning properly because of dirt or gummy grease. If you follow the system given you will undoubtedly locate the trouble.

## OVERLAND WIRING DIAGRAM

Q—Publish wiring diagram of the Overland 90.

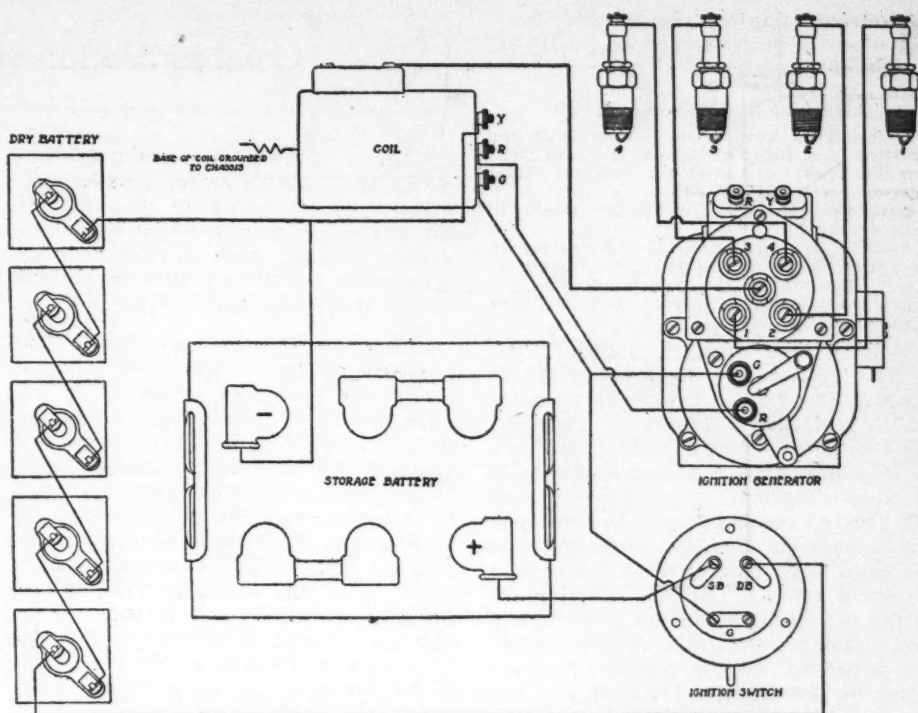


Fig. 10. Diagram of the National magneto used on the 1914 Reo

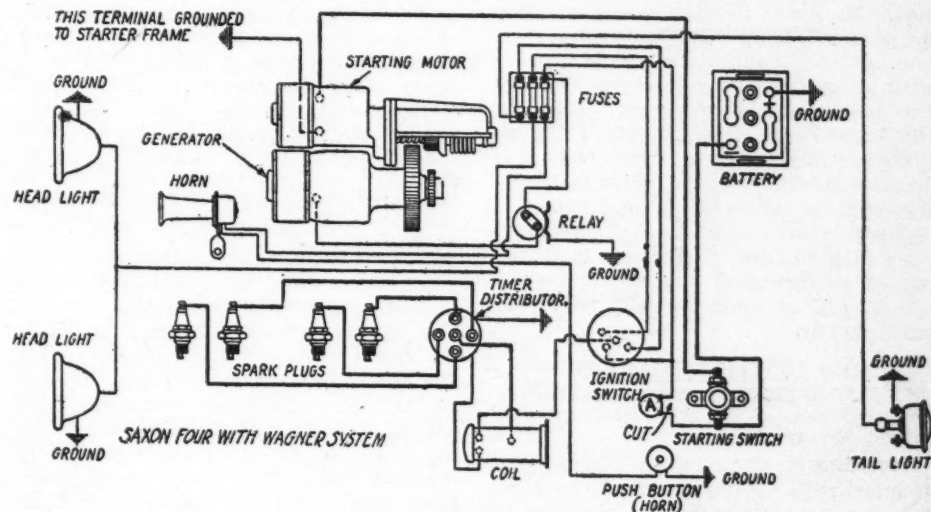
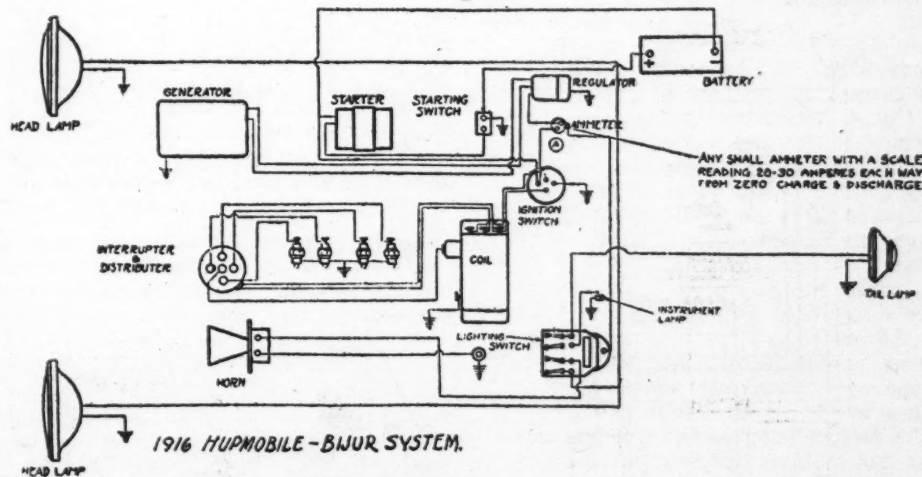


Fig. 11



**Fig. 12**

2—Also diagram of the Auto Lite generator showing brushes. Show how to increase the charging rate.—Hugh L. Russell, Sacaton, Arizona.

1—Wiring diagram of the Overland 90, which includes the generator show-

ing the brushes is shown in Fig. 9.

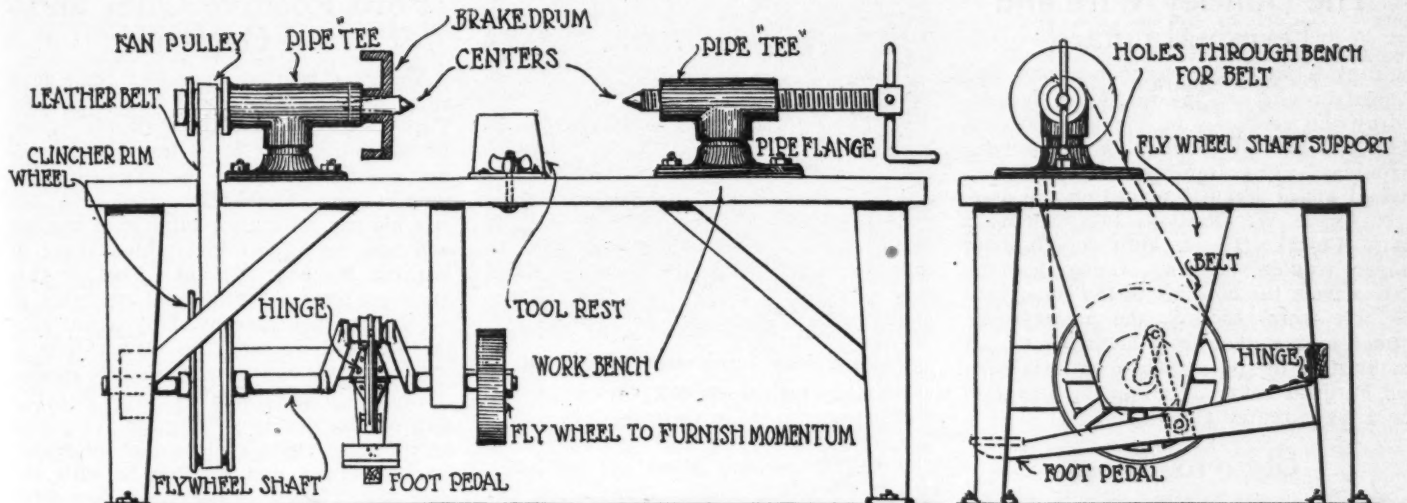
2—The issues of March 25 and May 20 give complete instructions for increasing the charging rate on a third brush system.





# The Automotive Repair Shop

## Practical Maintenance Hints



A repair man not wishing to invest in a lathe, because of the high cost, can construct one from discarded parts about the shop from the above sketch

### Improvised Speed Lathe for the Repair Shop

The high cost of lathes of any description made the small repairman reluctant about investing in one of these very useful and sometimes necessary features.

Following the details in the sketch, a lathe can be constructed of discards that will enable the repairman to do most any job that can be done in this type of machine, such as light turning, drilling, lapping, centering for straightening, etc.

To construct the main requirement is a rigid work bench. The head and tail supports are two pipe flanges bolted on

the bench. Two short sections of pipe carry pipe Tee's. These are bushed respectively for the pulley shaft and feed screw. A flanged pulley as is used on an engine fan can be used. The driving wheel can be made from an old clincher type of wheel, which rim serves to prevent the belt coming off.

If the wheel is too light to furnish the momentum to keep the head revolving, a discarded flywheel can be attached as shown. A hinged wooden foot pedal and connecting crank arranged as on a grindstone is the means of rotating the head. A circular disc, as a brake drum with holes drilled into the face permits swinging parts between the centers and using a lathe dog to turn the part.

Hand tools are used and the tool support consists of a bent plate and a clamp bolt. The belt connecting the pulleys passes through two openings cut through the benchtop.

### Special Tool for Loosening Battery Terminals

The terminals of storage batteries, after being connected for long periods, are difficult to remove. Hammering the connections frequently results in breakage and damage to the battery.

The tool shown in the illustration below will remove these terminals with the least of effort and without endangering the connection or the plates.

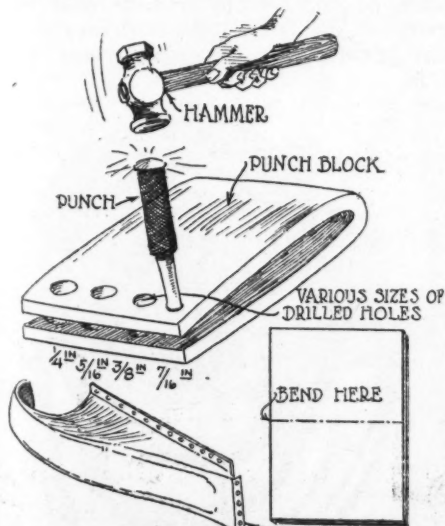
A yoke shaped strap of steel cut and bent as shown is fitted with a pivoted lever to pry the wire connection loose. A set screw permits of adjusting the tool to the various lengths of connections that are found on the different makes of batteries. The method of using the tool is not necessary to describe.

### Punch for Sheet Metal or Light Work

When it is desired to make a number of holes in sheet metal as in the fenders or sheet metal body of an automobile the punch as shown in the sketch is useful and will be found to save considerable time.

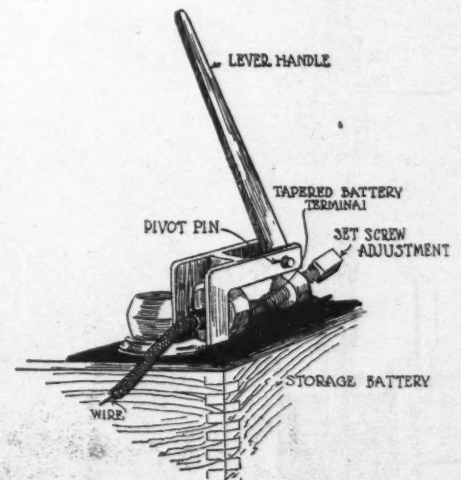
This punch may be made from a piece of one-quarter inch steel cold bent, leaving an aperture of the desired width.

Several holes of different diameter are then drilled through both sides of the steel. Using punches of corresponding size the holes are rapidly made at location in the sheet metal by one or two sharp blows from a hammer.



FOR PUNCHING HOLES IN MUD GUARD AND OTHER LIGHT SHEET METAL PARTS

Punch for sheet metal or light work



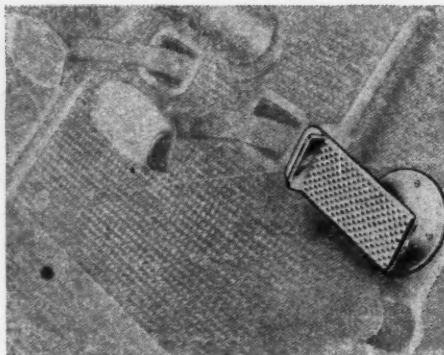
Special tool for loosening battery terminals. Hammering the connection often breaks them or damages the battery

# The Accessory Show Case

## New Fitments for the Car

### The Duntley Wire and Terminal Guard

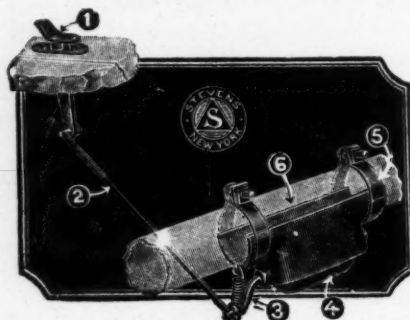
Broken wires, loose connections and short circuits are the factors which destroy the efficiency of the ignition system and are often annoying and serious troubles. The Duntley wire and terminal guard recently placed on the market by J. W. Duntley, 1014 Michigan Ave., Chicago, Ill., is built to eliminate these trouble factors. It carries the wires from the coil box to the timer in a flexible metal conduit and protects the timer with a dust-proof metal cover. It is built to fit the standard pattern Ford or Fordson timer and may be installed in a few minutes' time.



Feaster foot accelerator can be attached to any car

### Stevens Snap

The Stevens snap, an exhaust relief valve for Fords, is a simple, positive acting pedal with direct control of extra large damper which makes a quick and efficient cutout. This cut-out is simply operated, has no hooks or catches but controls the eccentric damper spring directly with an adjustable steel rod. It is easily installed and requires only a V-shape cut in the pipe. The Snap cut-out is manufactured by the Stevens & Co., 375 Broadway, New York, and is listed at \$1.70.

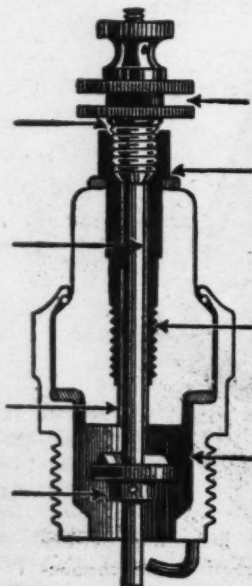


Stevens exhaust relief valve

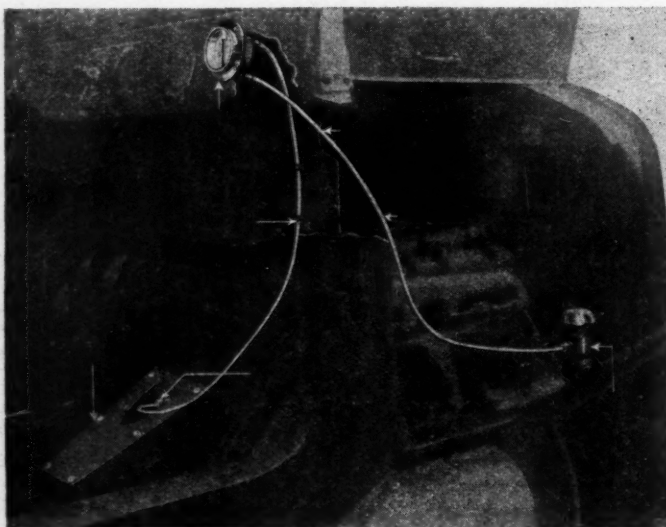
### Wellman Spark Plug

The Wellman-Muter Corp. of Chicago is offering a plug which they claim can positively be cleaned without removing it from the engine. It is a one-piece plug fitted with two sharp knives by means of which all carbon and oil deposits on the porcelain can be quickly cut

away. This operation is very simple, requiring but a few turns of the plug's head. This plug is a positive priming plug, the priming channel running down through the central body of the plug and conveying the fuel direct to the spark plug. It has a one-piece full-nickel electrode within an air chamber which permits the expansion and contraction.



Wellman spark plug



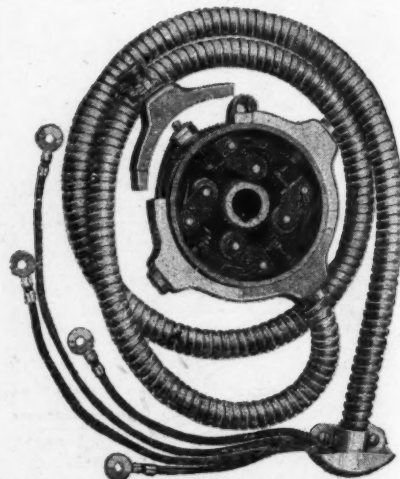
Positive oiler and gage for the Ford

### Ford Positive Oiler and Gage

This is a positive oiler and sight dash gage for the Ford car. It insures the Ford driver that he has a supply of oil, for as soon as the oil is low or the danger point is reached, the gage becomes inoperative. Thus the driver will not run his car mile after mile with low oil and run the almost inevitable danger of burning his bearings out. Further this gage supplies an additional quantity of oil, to that furnished by the internal pipe in the Ford engine. An oil strainer is also provided which continually strains the oil as it is circulated. The installation of this device is very simple. It is only necessary to remove the old transmission cover and replace it with the new one. The pipe leading to the gage is threaded underneath the floor board to the gage which is placed on the dash. The second lead from the gage runs directly to the oil filler plug of the engine, for which a special plug is provided in which is placed a fine mesh screen. This device is made by the Automotive Material Co., 208 N. Wabash Ave., Chicago.

### Feaster Foot Accelerator

The accelerator shown in the illustration operates sideways under the ball of the foot and can readily be attached to any car having a foot throttle, except in rare instances where the accelerator is between the brake and the clutch, and the room is limited. It is as large as the average brake or clutch pedal and is adjustable to any height angle or pitch desired. It is manufactured by Peter Gray & Sons, 3rd and Binney Sts., East Cambridge, Mass., and sells for \$2.50.



Duntley wire and terminal-guard for Ford and Fordson



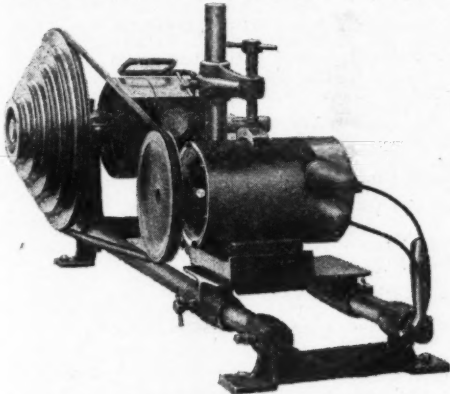
# Service Equipment

## Time Savers for the Shop

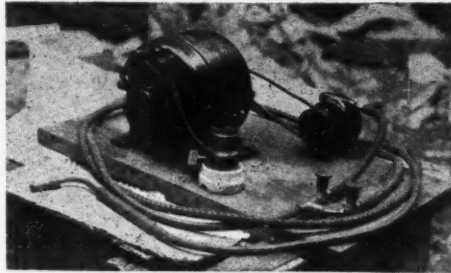
### Inexpensive Test Stand

Generally a test stand for all types of electrical generators, starting motors and magnetos is a very expensive piece of electrical equipment, costing in the neighborhood of \$500 or \$600 instead of less than \$100. For this reason test stands are not generally found in the average garage and service station. With the idea of making it possible for every garage owner to have a complete testing stand, David Onan, Minneapolis, Minn., manufacturer of automotive devices, designed a stand that was based on his fifteen years' experience repairing motor car electrical equipment.

The stand which is shown in the illustration herewith is complete, and will fit



Onan test stand for electrical equipment



Gas-Aeroblast for burning battery lead connections

all makes of generators, starting motors and magnetos with one exception. This exception is the old motor-generator used on the early models of the 1913 National cars. The stand is built up very rigidly of angle iron. Mounted on one end is the tight and loose pulley which can be belted to any line shaft or other power available. The shifter for the belt is the small handle on the right hand side of the machine. A cone pulley giving a number of different speeds for the generator is provided which will take care of all speed ranges. The testing ammeter is connected to the generator through the terminals which are threaded through the left hand support of the frame. Magnetos are tested on an insulated base so that the operator is assured he will not receive any shocks when touching the machine. The test stand complete with pulleys to fit all types of electrical machines, with the exception of that mentioned above is \$75.

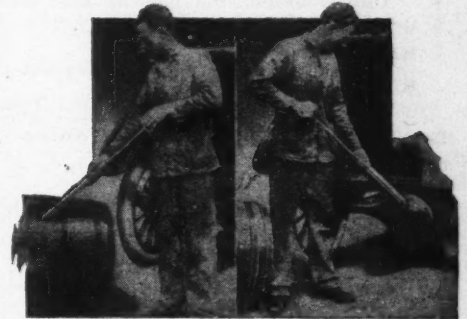
### Gas-Aeroblast

Two popular fuel mixtures have been used for burning of battery lead connections, city gas and oxygen or acetylene gas and oxygen. It has been found in many localities, that the city gas, while rich enough in heat units, is subject to a wide variation of pressure at different hours of the day and consequently there is a lack of uniform heat in the heat of the flame. The Gas-Aeroblast is a gas booster. It has a capacity of 12 cu. ft. per min. and it is claimed will raise the gas pressure from a few ounces to several pounds, if this is desired. When used in connection with the automotive craftsman torch and acetylene gas it is claimed that this machine affords a flame equal to acetylene and oxygen. It is a compact unit which may be seen in the illustration and is made up of a motor, either A.C. or D.C. compressor, torch with extra tips, bench block, tubing, etc. Its weight is 25 pounds and, of course, eliminates the cumbersome tanks and piping that have been used extensively in the past. Made by the Automotive Craftsman, 1428 S. Wabash Ave., Chicago.

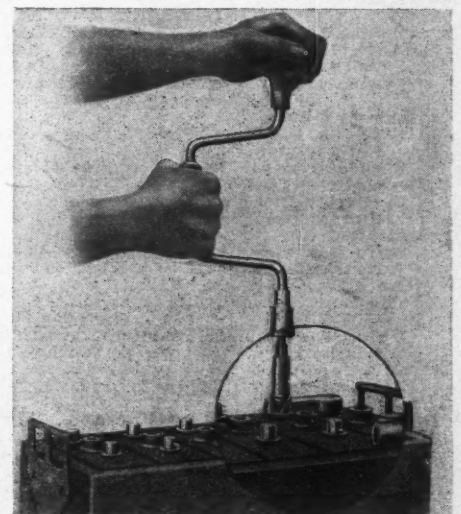
### Rose Grease Gun

The grease gun shown is of all steel construction, made to withstand the unusual hard use that a gun is submitted to in the field, the shop or in the factory. It is provided with a taper nozzle which can be used in any place that a curved nozzle can be used and fits all openings up to the diameter of the nozzle at its widest point, sufficiently to prevent the grease backing out as the gun is discharged.

The valve is of the double cup leather type. The Rose grease gun is a product of the J. H. Haney & Co., Hastings, Neb.



Rose grease gun is all steel construction to withstand hard usage



Link cutter made of high-grade tool steel and is easily sharpened

### Link Cutter

The link cutter is used as shown in the illustration, is self-centering and leaves posts original height to receive links, already to burn on. It is made of high-grade tool steel, can easily be sharpened and it is claimed will do a better job than other methods in about one half the time. This cutter is a product of the Auto Electric Sales Co., 2540 Hennepin Ave., Minneapolis.

# Where Parts for Old Models of Cars In Production Can Be Obtained

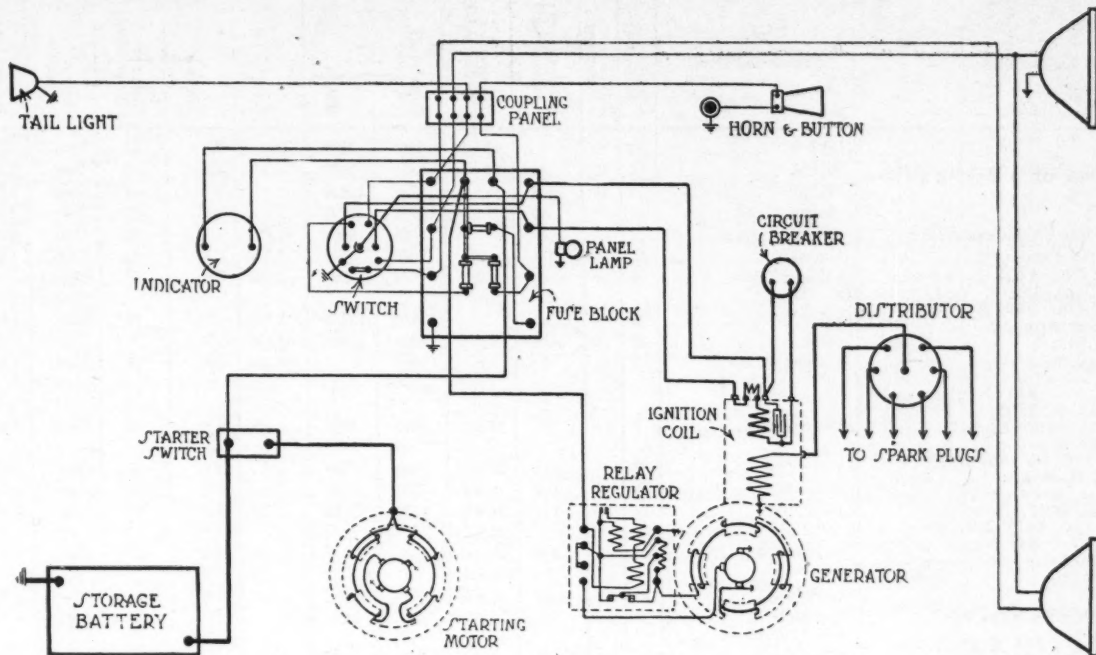
## Motor Age Maintenance Data Sheet No. 98

One of a series of weekly pages of information valuable to service men and dealers—save this page

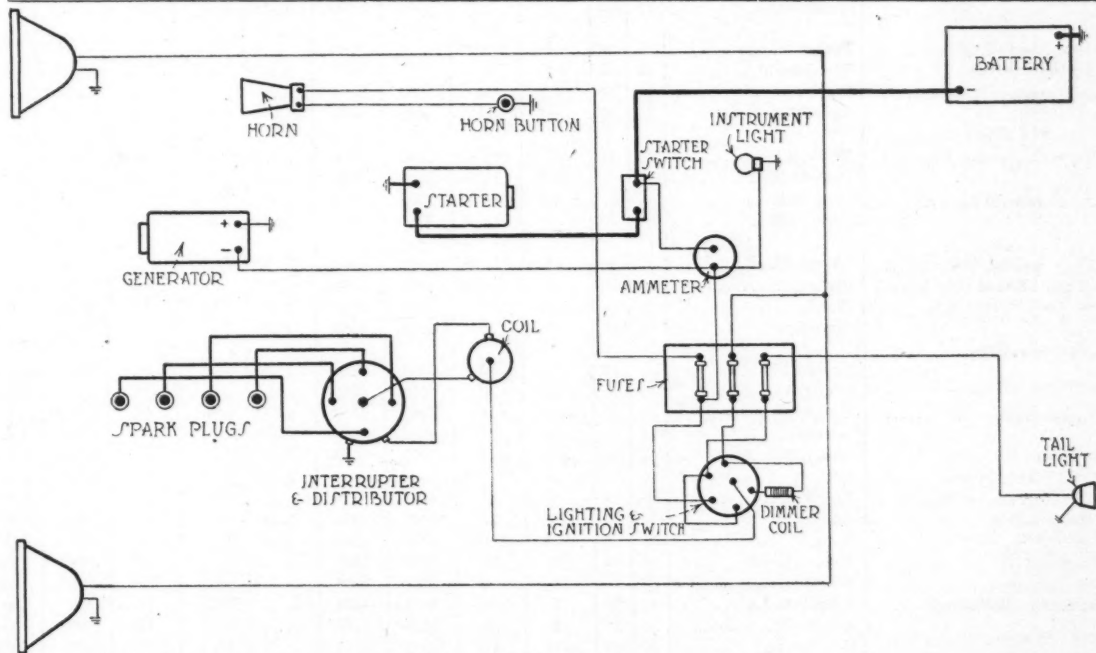
- Harroun**  
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
- Haynes**  
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.  
Auto Gear Co., 844 Eighth Ave., New York.  
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.  
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
- Hudson**  
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.  
Auto Gear Co., 844 Eighth Ave., New York.  
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.  
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.  
The Boneyard, Washington, Ia.
- Hupp (20, 32, K-N-R)**  
Marion Auto Service Co., New York.
- King**  
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.  
Auto Gear Co., 844 Eighth Ave., New York.  
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
- Kilne Kar**  
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
- Kissel**  
Auto Gear Co., 844 Eighth Ave., New York.  
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.  
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.  
The Boneyard, Washington, Ia.
- Lexington**  
Auto Gear Co., 844 Eighth Ave., New York.  
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.  
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
- McFarlan**  
Auto Gear Co., 844 Eighth Ave., New York.
- Mailbom**  
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
- Maxwell—Briscoe**  
Service Gear & Machine Co., Reading, Pa.  
Standard Motor Parts Co., New Castle, Ind.
- Maxwell 4-35**  
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.  
Auto Gear Co., 844 Eighth Ave., New York.  
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.  
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.  
Service Gear & Machine Co., Reading, Pa.  
Standard Auto Parts Co., New Castle, Ind.  
The Boneyard, Washington, Ia.
- Maxwell 6-50**  
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.  
Standard Motor Parts Co., New Castle, Ind.
- Mercer**  
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
- Mets**  
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.  
Auto Parts Co., 4116 Olive St., St. Louis.  
Metz Co., Waltham, Mass.  
The Boneyard, Washington, Ia.
- Mitchell**  
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.  
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.  
The Boneyard, Washington, Ia.
- Moline**  
Auto Gear Co., 844 Eighth Ave., New York.  
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.  
Auto Parts Co., 4116-18 Olive St., St. Louis.  
The Boneyard, Washington, Ia.  
Wichita Auto Wrecking Co., Wichita.
- Monitor**  
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
- Moon**  
Auto Gear Co., 844 Eighth Ave., New York.  
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.  
The Boneyard, Washington, Ia.
- Moore**  
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
- Nash**  
Hartford Motor Car Co., Hartford, Conn.  
Western Motor Car Co., 2831 Michigan Ave., Chicago.
- Oakland**  
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.  
Auto Gear Co., 844 Eighth Ave., New York.  
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.  
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.  
The Boneyard, Washington, Ia.
- Oldsmobile**  
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.  
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.  
Oldsmobile Co., 2035 S. Michigan Ave., Chicago.  
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
- Olympian**  
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
- Owen**  
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
- Packard**  
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.  
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
- Paige**  
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.  
Auto Gear Co., 844 Eighth Ave., New York.  
L. Wolf Auto Parts & Tire Co., 619 N. Illinois St., Indianapolis.  
Wichita Auto Wrecking Co., 801 W. Douglas Ave., Wichita.
- Paterson**  
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.  
Auto Gear Co., 844 Eighth Ave., New York.  
Auto Salvage Co., Tulsa, Okla.  
Wichita Auto Wrecking Co., 801 W. Douglas Ave., Wichita.
- Pilot**  
Auto Gear Co., 844 Eighth Ave., New York.
- Premier**  
Premier Motor Corp., Indianapolis.  
Wichita Auto Wrecking Co., 801 W. Douglas Ave., Wichita.
- Pullman**  
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.  
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.  
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.  
Auto Parts Co., 4116-18 Olive St., St. Louis.  
Jos. C. Gorey & Co., 354 W. 50th St., New York.  
Levene Motor Co., Philadelphia.  
Pullman Motor Car Co., New York.  
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.  
Service Gear & Machine Co., Reading, Pa.
- Reliance**  
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
- Reo**  
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.  
The Boneyard, Washington, Ia.
- Roamer**  
Barley Motor Car Co., Kalamazoo, Mich.
- Saxon**  
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.  
The Boneyard, Washington, Ia.
- Standard**  
Auto Gear Co., 844 Eighth Ave., New York.  
Puritan Machine Co., 409 Lafayette Blvd., Detroit.  
St. Louis Car Co., 5200 N. Second St., St. Louis.
- Stearns**  
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.  
F. B. Stearns Co., Cleveland, O.  
L. Wolf Auto Parts & Tire Co., 619 N. Illinois St., Indianapolis.  
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.  
Western Motor Car Co., 2831 Michigan Ave., Chicago.
- Stephens**  
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
- Stevens-Duryea**  
Frank Co., Paul A., 2349 Michigan Ave., Chicago.  
Newton Co., J. E., Fall River, Mass.  
Stevens-Duryea Co., 72 Twelfth St., San Francisco.
- Studebaker**  
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.  
Auto Gear Co., 844 Eighth Ave., New York.  
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.  
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
- Stutz**  
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.  
Auto Gear Co., 844 Eighth Ave., New York.  
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.  
Stutz Motor Car Co., 2450 Michigan Ave., Chicago.
- Velle**  
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.  
Auto Gear Co., 844 Eighth Ave., New York.  
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.  
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.  
The Boneyard, Washington, Ia.
- Westcott**  
Auto Gear Co., 844 Eighth Ave., New York.  
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.  
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
- White**  
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
- Wileox**  
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
- Willis-Knight**  
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
- Winton**  
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.  
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.



# Motor Age Weekly Wiring Chart No. 79



1916-1917 KISSEL 100 PT 6 REMY



1919 HUPMOBILE WESTINGHOUSE SYSTEM

1916-17 Kissel

1919 Hupmobile

Allen—Dec. 18, '19  
 Auburn—Nov. 27, '19; April 1, '20  
 Briscoe—May 6, '20  
 Cadillac—April 22, '20  
 Chalmers—Nov. 27, '19  
 Chandler—May 20, '20  
 Crow-Elkhart—April 22, '20  
 Cutting—Nov. 6, '19  
 Daniels—Dec. 4, '19  
 Davis—Dec. 4, '19  
 Dixie—April 1, '20  
 Dodge—April 15, '20  
 Dorris—Dec. 11, '19  
 Dort—March 25, '20  
 Eclair—May 6, '20

Essex—May 15-22, '19  
 Franklin—Dec. 11, '19  
 General Battery Charging—Sept. 25, '19  
 General Magneto Diagram—June 5, '19  
 Grant—April 29, '20  
 Internal Connections—July 10-17-24, '19  
 Jeffery—May 13, '20  
 Keeton—Nov. 6, '19  
 King—May 20, '20  
 Lexington—Jan. 1, '20  
 Liberty—Jan. 1, '20  
 Marmon—Dec. 25, '19; Jan. 22, '20  
 Mercer—Nov. 27, '19; March 25, '20  
 Mitchell—Jan. 8, '20  
 Moline-Knight—May 20, '20  
 Moon—Jan. 29, '20; March 11, '20  
 Moore—March 4, '20  
 Nash—March 11, '20  
 National—Feb. 12, '20  
 Oakland—April 15, '20  
 Oldsmobile—April 8, '20

Olympian—Jan. 22, '20  
 Packard—March 18, '20  
 Paige—July 3, '19; April 29, '20  
 Peerless—May 13, '20  
 Pierce-Arrow—Feb. 5, '20  
 Pilot—March 4, '20  
 Premier—Dec. 18, '19; Feb. 26, '20  
 Reo—Nov. 13, '19  
 Roamer—March 18, '20  
 Saxon—April 8, '20  
 Scripps-Booth—Jan. 15, '20  
 Stearns-Knight—Jan. 8, '20  
 Stephens—Feb. 12, '20  
 Studebaker—Dec. 25, '19  
 Stutz—Feb. 5, '20  
 Templar—Jan. 29, '20  
 Velle—Feb. 19, '20  
 Westcott—Jan. 15, '20  
 White—Feb. 10, '20  
 Willys-Knight—Feb. 26, '20  
 Special Systems for Fords—May 15-22, '19

# Motor Age Monthly Guide to Tractors

Line Number	Manufacturer	Tractor and Model	Drawbar horsepower	Belt horsepower	Number plows recommended	Size separator recommended	Pounds pull drawbar	Weight	Price	Traction	Diameter drive wheels	Make of engine	No. and type of cylinder	Bore and stroke	Normal H. P. M.
1	Advance-Rumely Thresher Co., Laporte, Ind.	Oil Pull.....	12	20	3	22 x 36	2150	6682	.....	Wh.	51	Own	2 Hor.	6 x 8	560
2		Oil Pull.....	16	30	4	28 x 44	2850	9600	.....	Wh.	56	Own	2 Hor.	7 x 8½	530
3		Oil Pull.....	20	40	5-6	32 x 52	3750	12820	.....	Wh.	64	Own	2 Hor.	8 x 10	450
4		Oil Pull.....	30	60	8-10	36 x 60	5900	26700	.....	Wh.	80	Own	2 Hor.	10 x 12	375
5	Allis-Chalmers Mfg. Co., Milwaukee, Wis.	Allis-Chalmers, 18-30.....	18	30	4	.....	3000	6000	\$1,885	Wh.	50	Own	4 Ver.	4¾ x 6½	830
6	Appleton Mfg. Co., Batavia, Ill.	Appleton.....	12	20	2-3	22	2000	4900	1,500	Wh.	54	Buda	4 Ver.	4¼ x 5½	1050
7	Aultman-Taylor Machinery Co., Mansfield, O.	Aultman Taylor.....	15	30	4	28	2800	7500	2,300	Wh.	70	Clim.	.....	5 x 6½	900
8		Aultman-Taylor.....	22	45	6	32	4800	13000	3,700	Wh.	70	Own	4 Ver.	4¾ x 6¾	600
9		Aultman-Taylor.....	30	60	8-12	.....	8000	23000	4,800	Wh.	90	Own	4 H or.	7 x 9	500
10	Automotive Corp., Toledo, Ohio.....	Automotive, B-3.....	12	24	2	26	2000	.....	3,400	Wh.	40	Herc.	4 Ver.	4 x 5½	1000
11	Avery Co., Peoria, Ill.	Avery, 8-16.....	8	16	2-3	22 x 32	1800	4900	.....	Wh.	50	Own	2 Hor.	5½ x 6	600-750
12		Avery, 12-25.....	12	25	3-4	20 x 30	2800	7500	.....	Wh.	56	Own	2 Hor.	6½ x 7	600-700
13		Avery, 14-28.....	14	28	3-4	24 x 36	3000	6800	.....	Wh.	60	Own	4 Hor.	4½ x 7	700-900
14		Avery, 18-36.....	18	36	4-5	24 x 36	3500	9250	.....	Wh.	65	Own	4 Hor.	5½ x 6	650-750
15		Avery, 25-50.....	25	50	5-6	28 x 46 32 x 54	4800	12500	.....	Wh.	69	Own	4 Hor.	6½ x 7	600-700
16	Bates Mach. & Trac. Co., Joliet, Ill.	Avery, 40-80.....	40	80	8-10	36 x 60	7600	22000	.....	Wh.	87½	Own	4 Hor.	7¾ x 8	500-600
17		Steel Mule.....	15	22	3	26 x 36	4600	.....	.....	Cr.	.....	Erd	4 Ver.	4¼ x 6	900
18	C. L. Best Gas Trac. Co., San Leandro, Calif.	Tracklayer, B.....	12	25	3	.....	2000	5100	2,600	Cr.	.....	Own	4 Ver.	4½ x 5¼	850
19		Tracklayer, A.....	35	60	9	.....	6500	17500	5,750	Cr.	.....	Own	4 Ver.	6½ x 3½	650
20	Boring Tractor Corp., Rockford, Ill.	Boring.....	24	2-16	24 x 36	.....	3600	1,595	Wh.	54	Wauk.	4 Ver.	4¾ x 5¼	1000	
21	Buckeye Mfg. Co., Anderson, Ind.	Trundaar, 10.....	25	40	4	.....	3750	8800	3,750	Ch. T.	.....	Wauk.	4 Ver.	5 x 6¼	900
22	Bull Tractor Co., Anderson, Ind.	Bull.....	12	24	2-3	26	1000	4996	1,200	.....	60	Toro	2 Hor.	5½ x 7	750
23	Burn-Oil Tractor Co., Peoria, Ill.	Burn-Oil.....	15	30	3-4	26	3000	5500	1,650	Wh.	56	Own	2 Hor.	6¾ x 7	700
24	J. I. Case Plow Works Co., Racine, Wis.	Wallis, K.....	15	25	3	24 x 40	2600	3560	.....	Wh.	48	Own	4 Ver.	4¼ x 5¾	900
25		Case, 10-18.....	10	18	2-3	20 x 28	1665	3820	1,800	Wh.	42	Own	4 Ver.	3¾ x 5	1050
26		Case, 15-27.....	15	27	3-4	26 x 46	2500	6460	1,800	Wh.	52	Own	4 Ver.	4½ x 6	600
27		Case, 22-40.....	22	40	5	32 x 54	3760	9700	2,850	Wh.	56	Own	4 Ver.	5½ x 6¾	850
28	Cleveland Trac. Co., Cleveland, Ohio.....	Cletrac, W.....	12	20	2	24 x 40	1500	3400	1,395	Cr.	.....	Own	4 Ver.	4 x 5½	1265
29	Coleman Trac. Sales Co., Kansas City, Mo.	Coleman.....	16	30	3	28 x 48	3000	5200	1,850	.....	44	Clim.	4 Ver.	5 x 6½	750
30	Dart Truck & Trac. Corp., Waterloo, Ia.	Blue J.....	15	30	3-4	28	2500	4500	2,000	Wh.	42	Buda	4 Ver.	4½ x 6	1050
31	Dauch Mfg. Co., Sandusky, Ohio.....	Sandusky J.....	10	20	3	22	2000	4080	1,650	Wh.	48	Own	4 Ver.	4¼ x 5¼	1050
32		Sandusky, E.....	15	35	4	30	3500	7670	2,500	Wh.	56	Own	4 Ver.	5 x 6½	750
33	Dayton-Dowd Co., Quincy, Ill.	Leader, B.....	12	24	2	20	2000	5200	.....	.....	48	Own	2 Hor.	6¼ x 6	800
34		Leader, N.....	16	32	3-4	28	3500	5800	2,150	Wh.	54	Clim.	4 Ver.	5 x 6½	800
35		Leader, C.....	18	36	3-4	28	4000	6500	2,650	Cr.	.....	Twin	4 Ver.	5 x 7½	750
36		Leader, D.....	20	40	4-5	28	5000	6500	3,150	Cr.	.....	Doman	4 Ver.	6 x 7	750
37	Dill Trac. Mfg. Co., Little Rock, Ark.	Dill.....	20	3	.....	.....	4400	2,480	Wh.	42	Cont.	4 Ver.	4½ x 5½	900	
38	Dubuque Trac. & Tr. Mfg. Co., Dubuque, Ia.	Klumb, F.....	16	32	3	28	3200	5250	.....	Wh.	45	Clim.	4 Ver.	5 x 6½	800
39	Eagle Mfg. Co., Appleton, Wis.	Eagle, F.....	12	22	2-3	24	2400	5850	1,390	Wh.	48	Own	2 Hor.	7 x 8	450
40		Eagle, F.....	16	30	3-4	28 x 30	3200	7100	1,850	Wh.	52	Own	2 Hor.	8 x 8	450
41	Electric Wheel Co., Quincy, Ill.	Allwork, C.....	14	28	3	28	3000	5000	.....	Wh.	48	Own	4 Ver.	5 x 6	800
42		E-B, Q.....	12	20	3	24	2000	6500	.....	Wh.	60	Own	4 Ver.	4¾ x 5	850
43	Emerson, Brantingham Co., Rockford, Ill.	E-B, 12-20, AA.....	12	20	3	24	2600	4355	.....	Wh.	54	Own	4 Ver.	4¾ x 5	900
44		E-B, 20-35.....	20	35	5	28	3300	9700	.....	Wh.	72	Own	4 Ver.	5¼ x 7	750
45		E-B, Reeves.....	40	65	8-10	44	10000	22750	.....	Wh.	90	Spec.	4 Ver.	7¼ x 9	500
46	Fageol Motors Co., Oakland, Calif.	Fageol, D.....	9	12	2	.....	1450	3500	1,525	.....	48	Lyc.	4 Ver.	3½ x 5	1250
47	Ford & Son, Inc., Henry, Dearborn, Mich.	Fordson.....	20	2	20 x 34	.....	1800	2700	850	Wh.	42	Own	4 Ver.	4 x 5	1000
48	Four-Drive Trac. Co., Big Rapids, Mich.	Fitch, 4.....	20	35	3-4	28 x 30	3200	6000	3,300	Wh.	F-36x12 R-42x12	Clim.	4 Ver.	5 x 6½	850
49		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
50	Franklin Trac. Co., Greenville, Ind.	Franklin Flexible, B.....	15	30	2-3	22 x 36	2500	3500	1,695	Cr.	None	Erd.	4 Ver.	4¼ x 6	1000
51	Frick Co., Waynesboro, Pa.	Frick.....	12	24	3	22 x 26	.....	5800	.....	Wh.	60	Erd.	4 Ver.	4 x 6	900-1000
52	General Ordnance Co., Cedar Rapids, Ia.	Frick.....	15	30	3-4	26	.....	6000	.....	Wh.	60	Beav.	4 Ver.	4¾ x 6	900-1000
53		G-O.....	14	28	3	30	.....	4200	1,485	Wh.	46	Wauk.	4 Ver.	4½ x 5¼	1000
54	General Tractors, Inc., Chicago.....	Monarch.....	9	16	2	.....	4000	1,650	Cr.	.....	.....	Own	4 Ver.	4 x 4	1000
55		Monarch.....	18	30	4	28	3300	8000	2,700	Cr.	.....	Beav.	4 Ver.	4¾ x 6	900
56	Gray Tractor Co., Minneapolis, Minn.	Gray.....	18	36	4	.....	2700	6185	.....	.....	54	Wauk.	4 Ver.	4¾ x 6¾	850
57	Hart-Parr Co., Charles City, Ia.	Hart-Parr, 30.....	30	3	28	3000	5570	1,395	Wh.	52	Own	2 Hor.	6½ x 7	750	
58	Holt Mfg. Co., Peoria, Ill.	Caterpillar, 5-Ton.....	25	40	4	32 x 52	3100	9400	.....	Cr.	.....	Own	4 Ver.	4¾ x 6	1050
59		Caterpillar, 10-Ton.....	40	60	6	40 x 60	5000	18800	.....	Cr.	.....	Own	4 Ver.	6½ x 7	700
60	Holton Tractor Co., Indianapolis, Ind.	Holton, 2-A.....	10	16	2-12	.....	2500	1,250	Wh.	42	Le Poi	4 Ver.	3¼ x 4½	1250	

Abbreviations: Traction—Wh., wheel; Cr., crawler. Engine—Beav., Beaver; Veer., Veerac; Herc., Hercules; Wauk., Waukesha; Buff., Buffalo; Asso., Associated Manufacturers; Auto., Automatic; Weid., Weidely; Clim., Climax; Twin, Twin City; Cont., Continental; Ruten, Rutenber; Over., Overland; Kenn., Kenneth. Cylinders—Ver., Vertical; Hor., horizontal; Opp., opposed. Fuel—G., gasoline; K., kerosene; D., distillate. Carburetor—Ray, Rayfield; King, Kingston; Holl., Holley; Scheb., Schebler; Ben., Bennett; Web., Webster; Zeph., Zephyr; Ens., Ensinger; Strom, Stromberg; Till., Tillotson; Zen., Zenith; Car., Carter. Air-Cleaner—Donal., Donaldson; Ben., Bennett; Hol., Holley. Magneto—A-K., Atwater-Kent; Sum., Sumter; Eise., Eiseman; Berl., Berling. Clutch—B. & B., Borg & Beck; Bier., Bierman; Mun., Muncie; Rock., Rockwood; spec., special. Gearset—B. & S., Brown & Sharpe; Nutt., Nuttall. Gearset type—Sl. G., sliding gear; Sel. G., selective gear; Fr., friction; Plan., planetary. Sl. J. C., sliding jaw clutch. Final Drive—S. G., spur gear; Ch., chain; D. R., double reduction; B. G., bull gear. Drive—Op., open; In., inclosed.



## and Their Technical Specifications

Normal H. P. M.	Line No.	Fuel	Make and size of carburetor	Make of air cleaner	Make of magneto	Make of clutch	Make of gearset	Type of gearset	Make of radiator	Make of bearings in transmission	Make of bearings in front axle	Make of bearings in rear axle	Belt pulley diameter	Belt pulley R. P. M.	Belt Speed F. P. M.	Speeds forward	Speed range M. P. H.	Recommended plowing speed	Final Drive	Drive	Furrow wheel	Line No.
560	1	K-D	2 1/4-Own	Donal.	Bosch	Own	Own	Sl. G.	Own	Own	Hyatt	Hyatt	19	560	2790	2	2.1-3.20	2.1	S. G.	Op.	No.	1
530	2	K-D	2 1/4-Own	Donal.	Bosch	Own	Own	Sl. G.	Own	Own	Hyatt	Hyatt	23	530	3190	2	2.1-3	2.1	S. G.	Op.	No.	2
450	3	K-D	2 1/4-Own	Donal.	Bosch	Own	Own	Sl. G.	Own	Own	Hyatt	Hyatt	26	450	3060	2	2-3.2	2	S. G.	Op.	No.	3
375	4	K-D	3 1/4-Own	None	Bosch	Own	Own	Sl. G.	Own	Own	Own	Own	36	375	3540	1	1.9	1.9	S. G.	Op.	No.	4
830	5	G-K	1 1/2-King	Ben.	Opt.	Own	Own	Sl. G.	Own	Hyatt	Own	Hyatt	15	830	3200	2	2.3-2.8	2.8		In.	Yes	5
1050	6	G-K	1 1/4-Scheb.	Ben.	Bosch	B. & B.	Nutt	Sl. G.	Perfex	Hyatt	Own	Hyatt	7 1/2	825	2600	2	2 1/4-3 1/2		I. G.		Yes	6
900	7	G-K-D	1 1/2-King	Ben.	Eise.	Own	Own	Sl. G.	Hooven	Hyatt	Own	Hyatt	20	450	2400	1	2.2-2.49	2.5	I. G.		Yes	7
600	8	G-K-D	2 -King		Eise.	Own	Own	Sl. G.	Own	Own	Own	Own	20	600	3150		1-2.93	2.13	B. G.		No	9
500	10	G-K-D	2 1/2-King		Eise.	Own	Own		Own	Own	Own	Own	24	500	3150	2.2	1-2.2	2.2	B. G.		No	10
1000	11	G-K	1 1/4-King.	Ben.	Eise.	B. & B.	Own	Sl. G.	McCord	U. S. Gurney Hyatt	Timk.	Timk.	10	996	2600	2	2 1/4-4	2 1/4	I. G.	In.	Yes	11
600-750	13	G-K	1 1/4-King.		K-W	Own	Own	C. M.	Own		Own	Own	17 1/2	600	2750	2	1 1/4-3	1 1/4	S. G.	Op.		13
600-700	14	D-A																				14
700-900	16	G-K-D	1 1/2-King.		K-W	Own	Own	C. M.	Own		Own	Own	19 1/2	600	2910	2	1 1/4-2 1/4	1 1/4	S. G.	Op.		16
650-750	17	G-K-D	1 1/4-King.		K-W	Own	Own	C. M.	Own		Own	Own	16	700	2930	2	2 1/4-3 1/2	2	S. G.	Op.		17
	18	G-K-D	1 1/2-King.		K-W	Own	Own	C. M.	Own		Own	Own	18	650	3065	2	2-3	2	S. G.	Op.		18
600-700	19	G-K-D	2-King.		K-W	Own	Own	C. M.	Own		Own	Own	22	600	2880	2	2-3	2	S. G.	Op.		19
500-600	21	G-K-D	2-King.		K-W	Own	Own	C. M.	Own		Own	Own	26	500	3400	2	1 1/4-2 1/2	1 1/4	S. G.	Op.		21
900	22	G-K-D	1 1/4-Ben.	Ben.	Dixie	B. & B.	Own	Sl. G.	Modine	Timk.	Timk.	T. & H.	12	725	2300	2	2.33-3.5	2.33	S. G.			22
850	23	D	1 1/2-Ens.	Ben.	Split.	Own	Own	Sl. G.	Own	Hyatt Timk.		Hyatt	9	9000	1971	2	2 1/4-3	3	I. G.			23
650	25	D	2-Ens.	Ben.	Bosch	Own	Own	Sl. G.	Own	Hyatt Timk.		Timk.	16	650	2720	2	3-2	3	I. G.			25
1000	27	G-K	1 1/4-King.	Ben.	King.	Twin	Own	Sl. G.	Perfex.	Hyatt	Hyatt	Hyatt		421		2	2-3	2 1/2	Ch.	In.	Yes	27
900	28	G-K-D	-Strom.	Own	Bosch	Hill.	Own	Sl. G.	Modine	Opt.		H. & T.		900	2600	2	1.3-2.5		S. G.	In.		28
750	29	G-K-D	1 1/2-King.	Donald.	K-W								12	750		1	2.4-2 1/4	2.4	B. G.			29
700	30	K	1 1/2-Scheb.	Ben.	K-W	Own	Own	Sl. G.	Eureka	S.K.F.	Own	Own	13	700	2600	2	2-3	3	I. G.	In.	Yes	30
900	31	G-K-D	1 1/4-Ben.	Ben.	Berl.	Twin	Own	Sl. G.	Modine	Timk.	Hyatt	Timk.	18	430		2	1 1/2-3 1/2	2 1/2-3 1/2	S. G.			31
1050	32	K	1 1/2-King.	Own	King.	Own	Own	Sl. G.	Own	Hyatt	Own	Hyatt	14 1/2	1050	3731	2	2 1/4-3 1/2	2 1/4	S. G.	In.	No	32
900	33	K	1 1/2-King.	Own	Bosch	Own	Own	Sl. G.	Own	Hyatt	Own	Hyatt	16	900	3762	2	2 1/4	2 1/4	S. G.	In.	No	33
850	34	K	2-King.	Own	Bosch	Own	Own	Sl. G.	Own	Hyatt Timk.	Timk.	Hyatt	16 1/2	850	3669	2	1.2-3.2	2.2	S. G.	In.	No	34
1265	35	G-K-D	1 1/2-King.	Own	Teagle	Own	Own	Sl. G.	McCord		Timk.	Timk.	8	1265	2500	1	1-3 1/2	3	I. G.	In.		35
750	36	G-K	1 1/2-Ben.	Ben.	Dixie	Own	Own	Sl. G.	Own	Opt.	Own	Own	14	750	2750	2	2-3	3	Worm			36
1050	37	G	1 1/2-King.	R. W.	Split.	Delt.	Own	Sel.	Own	Gurney	Timk.	Timk.	12	710	2600	3	1 1/4-6	2 1/4	D. R.	In.	Yes	37
1050	38	G-K-D	1 1/4-King.	Ben.	Dixie	Own	Own	Sel.	Perfex	Hyatt N. D.	Own	Own	10	1000	2600	2	2-3	2	I. G.		Yes	38
750	39	G-K-D	2 -King.	Ben.	Dixie	Own	Own	Sel.	C. & P.	Own	Own	Own	15	800	2950	3	2-5 1/4	2	I. G.	Op.	No	39
800	40	K	1 1/2-King.	Own	King.	Own	Own	Sel.	Eureka	Own	Own	Own	14	800	2800	2	2 1/4-3 1/2	2 1/4	I. G.	Op.		40
800	41	K	1 1/2-Strom.	Ben.	Eise.	B. & B.	Own	Sel.	Own	Opt.	Hyatt	Hyatt	14	800	2900			3 1/2	I. G.	In.		41
750	42	K-D	1 1/2-King.	Ben.	K-W	Own	Own	Sel.	Eureka	Own	Own	Own	14	750	2700	2	1.8-2 1/2	1.8	Ch.	Op.		42
750	43	G-K-D	1 1/2-Holl.	Ben.	Dixie	Own	Own	Sel.	Eureka	Own	Own	Own	14	750	2700	2	1.8-2 1/2	1.8	Ch.	Op.		43
900	44	G	1 1/2-King.	Donald.	Bosch	B. & B.	Cotta	Sl. G.	Eureka	S.K.F.	Hyatt	Hyatt				3	1-5	3	Ch.			44
800	45	K	1 1/2-Strom.	Ben.	Dixie	Own	Own	C. M.	Hooven	Hyatt	Hyatt	Hyatt	14	800	2600	2	2 1/4-4	2 1/4		In.		45
450	46	G-K		Own	Dixie	Own	Own	Sl. G.	Perfex	Hyatt	Own	Own	20	450	2350	2-3	1 1/2	2	G.		Yes	46
450	47	G-K		Own	Dixie	Own	Own	Sl. G.	Perfex	Hyatt	Own	Own	24	450	2827	2-3	1 1/2	2	G.		Yes	47
800	48	K	1 1/2-King.	Ben.	King.	Own	Own	Sl. G.	Perfex	Hyatt			13 1/2	800	2500	3	1 1/2-3 1/2	2 1/2	B. G.			48
850	49	K	1 1/2-Ben.	Ben.	K-W	Own	Own	Sl. G.	Perfex	Own	Own	Own	12	800	2225	3	1 1/2-3.64		B. G.	Op.	Yes	49
900	50	K	1 1/2-Strom.	Ben.	K-W	Own	Own	Sl. G.	Perfex	Hyatt	Own	Own	12	900	2800	2	2.01-2.78	2.78	I. G.	In.	No	50
750	51	K	1 1/2-Ben.	Ben.	K-W	Own	Own	Sl. G.	Modine	Hyatt	Own	Hyatt	16	597	2500	2	1.81-2.33	2.33	G.	Op.	No	51
500	52	K	2 1/2-King.	Ben.	K-W	Own	Own	Sl. G.	Perfex	Hyatt	Own	Hyatt	22	500	2880	1	2		G.	Op.		52
1250	53	G-K-D	1 -Zen.	Own	Dixie	Own	Own	C. M.	Modine	Timk.	Timk.	Timk.	8	1250	2600	1	3/4-3	2 1/2	S. G.			53
1000	54	K	-Holl.	Own	Own	Own	Own	Sel.	Own	Gurney S. R. B.	Timk.	Gurney S. R. E.	9 1/2	1000	2480	3	1-8	2 1/4	Worm	In.		54
850	55	K	1 1/2-King.	Ben.	Dixie	B. & B.	Cotta	Ind. Cl.	Spirex	Timk.	Timk.	Timk.	14	650	2275	3	3/4-4	2 1/4	F. Bevel R. Worm		No	55
1000	56	G-K	1 1/4-King.	Ben.	Eise.	B. & B.	Own	St. G.	McCord	N. D.	Timk.	Timk.	10	1000	2618	3	2-3-4	3	B. G.	In.	None	56
900-1000	57	K	-King.	Ben.	King.	Own	Nutt.	S.	Perfex	Hyatt	Own	Own	13	900	3060	2	2.3-3.8	2 1/2	S. G.		Yes	57
900-1000	58	K	-Ben.	Ben.	Dixie	Own	Nutt.	S.	Perfex	Hyatt	Own	Own	13	900	3060	2	2.3-3.8	2 1/2	S. G.		Yes	58
1000	59	G-K	1 1/4-King.	Ben.	Eise.		Own	C. M.	Perfex	S. K. F.			10	970		6	1 1/4-3	2 1/2	S. G.	In.	No	59
1000	60	G-K-D	1-King.	Ben.	K-W	M. & E.	Own	Sl. G.	Perfex				10 1/4	1000	2600	3	1 1/2-3 1/2	2 1/4	G.			60
900	61	G-K-D	1 1/2-King.	Ben.	K-W	M. & E.	Own	Sl. G.	Perfex				16	600	2600	3	1 1/2-3 1/2	2 1/4	Ch.			61
850	62	G-K	1 1/2-Ben.	Ben.	Bosch	Own	Own		S-J	Hyatt		Hyatt	11 3/8	850	2900	2	2 1/2	2 1/4	Ch.	In.	Yes	62
750	63	K	K-Shunt	Own	K-W	Own	Own	Sl. G.	S-J	S.K.F. Hyatt	Own		14	750	2750	2	2-3	3	I. G.	Op.	Yes	63
1050	64	G	1 1/2-Scheb.	Donald	Eise.	Own	Own	Sl. G.	Modine	Hyatt	Hyatt	Hyatt	12	1012	3150	3	1.5-5.7	3	G.	In.	No	64
700	65	G	2 -King.	Donald	K-W	Own	Own	Sl. G.	Own	Hyatt	Hyatt	Hyatt	14	850	3120	3	1.65-4.78	3	G.	In.	No	65
1250	66	G	3/4-King.	Ben.	Eise.	Detl.	Covert	Sl. G.	Perfex				6	1250	1963	3	3/4-4	2 1/4	I. G.		Yes	66

Abbreviations: Traction—Wh., wheel; Cr., crawler. Engine—Beav., Beaver; Veer., Veerac; Herc., Hercules; Wauk., Waukesha; Buff., Buffalo; Asso., Associated Manufacturers; Auto., Automatic; Weld., Weidely; Clim., Climax; Twin, Twin City; Cont., Continental; Ruten, Rutenberg; Over., Overland; Kenn., Kenneth. Cylinders—Ver., Vertical; Hor., horizontal; Opp., opposed. Fuel—G., gasoline; K., kerosene; D., distillate. Carburetor—Ray., Rayfield; King, Kingston; Holl., Holley; Scheb., Schaebler; Ben., Bennett; Web., Webster; Zeph., Zephyr; Ens., Ensigen; Strom., Stromberg; Till., Tillotson; Zen., Zenith; Car., Carter. Air-Cleaner—Donal., Donaldson; Ben., Bennett; Hol., Holley. Magneto—A. K., Atwater-Kent; Sum., Sumter; Eise., Eiseman; Berl., Berling. Clutch—B. & B., Borg & Beck; Bier., Bierman; Mun., Muncie; Rock., Rockwood; spec., special. Gearset—B. & S., Brown & Sharpe; Nutt., Nuttall. Gearset type—Sl. G., sliding gear; Sel. G., selective gear; Fr., friction; Plan., planetary. Sl. J. C., sliding jaw clutch. Final Drive—S. G., spur gear; Ch., chain; D. R., double reduction; B. G., bull gear. Drive—Op., open; In., enclosed.

# Motor Age Monthly Guide to Tractors

Line Number	Manufacturer	Tractor and Model	Drawbar horsepower	Belt horsepower	Number plows recommended	Size separator recommended	Pounds pull drawbar	Weight	Price	Traction	Diameter drive wheels	Make of engine	No. and type of cylinder	Bore and stroke	Normal R. P. M.
75	Huber Mfg. Co., Marion, Ohio.....	Huber, 12-25.....	12	25	3	24 x 42	2400	5000	.....	Wh.	60	Wauk.	4 Ver.	4 1/2 x 5 1/2	1000
76	Illinois Tractor Co., Bloomington, Ill.....	Illinois, C.....	18	30	4	24 x 28	3500	5200	2,375	Wh.	54	Clim.	4 Ver.	5 x 6 1/2	800
77	.....	International.....	8	16	2	.....	1350	3600	.....	Wh.	40	Own	4 Ver.	4 1/2 x 5	1000
78	International Harvester Co., Chicago.....	Titan.....	10	20	3	.....	1800	5710	.....	Wh.	54	Own	2 Hor.	6 1/2 x 8	575
79	.....	International.....	15	30	4	.....	2500	8990	.....	Wh.	66	Own	4 Hor.	5 1/2 x 8	575
80	J. T. Tractor Co., Cleveland, Ohio.....	J. T., N.....	16	40	3	30	3200	7000	2,800	Wh.	48	Chief	4 Ver.	4 1/2 x 6	1000
81	Kardell Trac. & Tr. Co., St. Louis, Mo.....	Kardell Utility.....	10	20	2	1700	3500	1,350	.....	Wh.	.....	Wis.	4 Ver.	4 x 5	1200
82	Keck Gonnerman Co., Mt. Vernon, Ind.....	Keck-Gonnerman, B.....	12	24	3	24 x 40	2500	6500	1,500	Wh.	60	Own	2 Hor.	7 1/2 x 8	700
83	.....	Flour City, Jr.....	14	24	3	24	.....	.....	.....	.....	60	Own	4 Ver.	5 x 5	800
84	Kinnard & Sons Mfg., Co. Minneapolis, Minn.....	Flour City.....	20	35	4-5	28	10000	.....	.....	.....	72	Own	4 Ver.	5 1/2 x 6	800
85	.....	Flour City.....	30	50	6-8	30	14000	.....	.....	.....	84	Own	4 Ver.	6 1/2 x 7	550-600
86	.....	Flour City.....	40	70	8-10	36	21000	.....	.....	.....	96	Own	4 Ver.	7 1/2 x 9	450-500
87	La Crosse Trac. Co., La Crosse, Wis.....	La Crosse, G.....	12	24	3	24	2000	4000	945	Wh.	56	Own	2 Hor.	6 x 7	900
88	Lauson, John Mfg., Co., New Holstein, Wis.....	Full Jewel.....	15	29	3-4	24 x 30	3000	6500	2,150	Wh.	54	Beav.	4 Ver.	4 1/2 x 6	950
89	Liberty Tractor Co., Minneapolis, Minn.....	Liberty.....	18	32	4	30	3380	5900	2,475	Wh.	48	Clim.	4 Ver.	5 x 6 1/2	850
90	Magnet Tractor Co., Minneapolis, Minn.....	Magnet, B-14-28.....	14	23	3	24	2600	4500	1,850	Wh.	48	Wauk.	4 Ver.	4 1/2 x 6 1/2	900
91	.....	Twin City, 12-20.....	12	20	3	20 x 24	2000	4200	.....	Wh.	50	Own	4 Ver.	4 1/2 x 6	1000
92	.....	Twin City, 16-30.....	16	30	4	24 x 23	3000	7800	.....	Wh.	54	Own	4 Ver.	5 x 7 1/2	650
93	Minneapolis Steel & Machinery Co., Minneapolis, Minn.....	Twin City, 25-45.....	25	45	6	32 x 34	6700	16000	.....	Wh.	76	Own	4 Ver.	6 1/2 x 8	600
94	.....	Twin City, 40-65.....	40	65	8	40	7500	23700	.....	Wh.	84	Own	4 Ver.	7 1/2 x 9	535
95	.....	Twin City, 60-90.....	60	90	12	40	11250	2800	.....	Wh.	84	Own	6 Ver.	7 1/2 x 9	535
96	Mobile Tractor Co., Mobile, Ala.....	Mobile.....	12	24	3	.....	3200	.....	1,450	.....	.....	Here.	.....	4 1/2 x 5 1/2	.....
97	Moline Plow Co., Moline, Ill.....	Moline Orchard.....	9	18	2	24	2000	3380	.....	Wh.	44	Own	4 Ver.	3 1/2 x 5	.....
98	.....	Oil-Gas, 18-36.....	18	36	4	30 x 46	.....	13500	.....	Wh.	64	Own	2 Hor.	8 x 10	400-450
99	Nichols & Shepard Co., Battle Creek, Mich.....	Oil-Gas, 25-50.....	25	50	6	32 x 52	19000	.....	.....	Wh.	69	Own	2 Hor.	9 x 12	350-425
100	.....	Oil-Gas, 35-70.....	35	70	8-10	40 x 60	30000	.....	.....	Wh.	73	Own	2 Hor.	10 1/2 x 14	300-375
101	Oliver Tractor Co., Knoxville, Tenn.....	Oliver, B.....	15	30	3-4	32	2800	7700	.....	.....	.....	Beav.	4 Ver.	4 1/2 x 6	900
102	Parrett Tractor Co., Chicago Heights, Ill.....	Parrett, H.....	12	25	3	26	2800	5225	.....	Wh.	60	Buda	4 Ver.	4 1/2 x 5 1/2	1000
103	Peoria Tractor Corp., Peoria, Ill.....	Peoria, J.....	12	25	3	26	3000	5100	1,985	Wh.	56	Clim.	4 Ver.	5 x 6 1/2	800
104	Pioneer Tractor Co., Winona, Minn.....	Pioneer, 18-36.....	18	36	4	28	4000	6100	.....	.....	60	Own	4 Hor.	5 1/2 x 6	750
105	.....	Pioneer, 30.....	30	60	10	36	8000	24000	.....	.....	96	Own	4 Hor.	7 x 8	650
106	Plow Man Tractor Co., Waterloo, Ia.....	Plow Man, 15-30.....	15	30	3-4	30	3000	5100	1,895	Wh.	60	Buda	4 Ver.	4 1/2 x 6	1000
107	Pope Mfg. Co., Watertown, S. D.....	Dakota, 4.....	15	27	3	24	2000	5700	1,750	Wh.	42	Doman	4 Ver.	4 1/2 x 6	800
108	Post Tractor Co., Cleveland.....	Post, D.....	12	20	2	.....	4300	.....	.....	Wh.	32	Wauk.	4 Ver.	4 1/2 x 5 1/2	800
109	Pt. Huron Eng. & T. Co., Pt. Huron, Mich.....	Port Huron, 12-25.....	12	25	3	22 x 38	2250	5900	.....	Wh.	56	Chief	4 Ver.	4 1/2 x 6	900
110	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
111	Reed Fdy. & Mach. Co., Kalamazoo, Mich.....	One-Man.....	12	25	3	22 x 24	5000	1,685	.....	Wh.	60	Wauk.	4 Ver.	4 1/2 x 5 1/2	1000
112	Rock Island Plow Co., Rock Island, Ill.....	Heider, D.....	9	16	2	20	1500	4000	.....	Wh.	54	Wauk.	4 Ver.	4 1/2 x 5 1/2	1000
113	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
114	.....	Heider, C.....	12	20	2	24	2000	6000	.....	Wh.	57	Wauk.	4 Ver.	4 1/2 x 6 1/2	900
115	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
116	.....	Russell Junior.....	12	24	2	18	2000	6200	.....	Wh.	53	Wauk.	4 Ver.	4 1/2 x 5 1/2	1000
117	Russell & Co., Massillon, Ohio.....	Russell Little Boss.....	15	30	3	24	3000	6900	.....	Wh.	53	Wauk.	4 Ver.	4 1/2 x 6 1/2	950
118	.....	Russell Big Boss.....	20	35	4	30	4000	7600	.....	Wh.	60	Model	4 Ver.	5 1/2 x 7	825
119	.....	Russell Giant.....	30	60	8	40	6000	24000	.....	Wn.	84	Own	4 Ver.	8 x 10	525
120	Samson Tractor Co., Janesville, Wis.....	Samson, D.....	.....	.....	1	.....	.....	630	.....	Wh.	.....	.....	4 Ver.	.....	.....
121	.....	Samson, M.....	.....	.....	2	20 x 32	.....	840	.....	Wh.	.....	.....	4 Ver.	.....	.....
122	Shaw Enochs Trac. Co., Minneapolis, Minn.....	Shawnee.....	9	18	2	22	2100	3800	.....	Wh.	60	Gray	4 Ver.	3 1/2 x 5	1200
123	Shelby Trac. & Tr. Co., Shelby, Ohio.....	Shelby, C.....	9	18	2	22	3500	.....	.....	Wh.	42	Wauk.	4 Ver.	3 1/2 x 5 1/2	1000
124	.....	Shelby, D.....	15	30	.....	.....	4600	.....	.....	Wn.	48	Spec.	.....	4 1/2 x 6	1100
125	Short Turn Tractor Co., Minneapolis, Minn.....	Short Turn, D.....	20	40	3	24	5000	1,500	.....	Wh.	65	.....	4 Ver.	4 1/2 x 6	950
126	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
127	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
128	Square Turn Tractor Co., Norfolk, Nebr.....	Square Turn, A.....	18	35	3	28	3200	7400	.....	.....	60	Clim.	4 Ver.	5 x 6 1/2	850
129	Stocketon Tractor Co., Stockton, Cal.....	Stocketon, A.....	8	13	2-3	20 x 34	1850	3150	1,225	Wh.	44	H-S.	4 Ver.	3 1/2 x 5	.....
130	Stinson Trac. Co., Superior, Wis.....	Stinson, 4-E.....	18	36	4	28 x 30	7100	.....	.....	Wh.	60	Beav.	4 Ver.	4 1/2 x 6	950
131	Tioga Mfg. Co., Philadelphia, Pa.....	Tioga, 3.....	15	27	3-4	.....	4950	.....	.....	Wh.	36	Wis.	4 Ver.	4 1/2 x 6	1000
132	Topp-Stewart Trac. Co., Clintonville, Wis.....	Topp-Stewart, B.....	30	45	4-6	.....	7600	7500	3,500	Wh.	42	Wauk.	4 Ver.	4 1/2 x 6 1/2	900
133	Toro Motor Co., Minneapolis, Minn.....	Toro.....	12	24	2-12	.....	1000	2300	.....	Wh.	42	Le Roi	4 Ver.	3 1/2 x 4 1/2	1200
134	Traylor Engrg. & Mfg. Co., Cornwells, Pa.....	Traylor, 6-12.....	6	12	1	.....	1700	815	.....	Wh.	38	Le Roi	4 Ver.	3 1/2 x 4 1/2	1000
135	Turner Mfg. Co., Pt. Washington, Wis.....	Simplicity.....	14	25	3	24	2600	4300	1,695	Wh.	54	Buda	4 Ver.	4 1/2 x 5 1/2	1000
136	U. S. Trac. & Machy. Co., Menasha, Wis.....	Uncle Sam, B-19.....	20	30	3	28	3000	4250	.....	Wh.	50	Beav.	4 Ver.	4 1/2 x 6	900
137	Victory Tractor Co., Greensburg, Ind.....	Victory, 9-18.....	9	18	2	20	1500	3300	1,385	Wh.	48	Gray	4 Ver.	3 1/2 x 5	1000
138	.....	Victory, 15-30.....	15	30	3	28	2500	3450	1,750	Wh.	48	Wauk.	4 Ver.	4 1/2 x 5 1/2	900
139	Vim Tractor Co., Schleisingerville, Wis.....	Vim.....	10	20	2-3	20	1800	3200	1,650	Wh.	48	Wauk.	4 Ver.	3 1/2 x 5 1/2	1050
140	Waterloo Gasoline Eng. Co., Waterloo, Ia.....	Waterloo Boy, N.....	12	25	3	.....	2000	5900	.....	Wn.	52	Own	2 Hor.	6 1/2 x 7	750
141	Wetmore, H. A., Sioux City, Ia.....	Wetmore.....	12	25	2	22	2900	.....	1,485	Wh.	46	Wauk.	4 Ver.	4 x 5 1/2	960
142	Wisconsin Farm Trac. Co., Sauk City, Wis.....	Wisconsin, E.....	16	30	3-4	28	3500	5440	.....	Wh.	52	Clim.	4 Ver.	5 x 6 1/2	800
143	Yuba Mfg. Co., Marysville, Calif.....	Ball Thread.....	12	20	3	.....	3500	6750	2,945	Cr.	.....	Wauk.	4 Ver.	4 1/2 x 6 1/2	700
144	.....	Ball Thread.....	20	35	5-6	.....	6000	10100	4,655	Cr.	.....	Wis.	4 Ver.	5 1/2 x 7	700

## One and Two-Horse Tractors

145	Allis Chalmers Mfg. Co., Milwaukee, Wis.....	General Purpose.....	6	12	1-16	.....	1000	2500	795	Wh.	48	Le Roi	4 Ver.	3 1/2 x 4 1/2	1000
146	Atlantic Meh. Mfg. Co., Cleveland, Ohio.....	Merry Garden.....	.....	2	.....	.....	.....	250	195	.....	20	.....	1 Ver.	2 1/2 x 2 1/2	900
147	Avery Co., Peoria, Ill.....	Avery, 5-10 B.....	5	10	2	22 x 32	800	2600	.....	Wh.	38	Own	4 Ver.	3 x 4	1200
148	.....	Avery, 6-cyl.....	7	12	.....	22 x 32	.....	3150	.....	Wh.	38	Own	6 Ver.	3 x 4	1200
149	Beeman Tractor Co., Minneapolis, Minn.....	Beeman G.....	2	4	1-7	.....	260	550	310	Wh.	25	Own	1 Ver.	3 1/2 x 4 1/2	850
150	Consolidated G. & Gas. Eng. Co., New York.....	Do-It-All.....	3	6	1	.....	1000	495	.....	.....	24	Own	1 Ver.	4 1/2 x 5	900



## and Their Technical Specifications

R. P. M.	Line No.	Fuel	Make and size of carburetor	Make of air cleaner	Make of magnet	Make of clutch	Make of gearset	Type of gearset	Make of radiator	Make of bearings in transmission	Make of bearings in front axle	Make of bearings in rear axle	Belt pulley diameter	Belt pulley R. P. M.	Belt Speed F. P. M.	Speeds forward	Speed range M. P. H.	Recommended plowing speed	Final Drive	Drive	Furrow wheel	Line No.
1000	75	G-K	1/4-King.	Ben.	King.	Own	Own	Sel.	Perfex	G. & H.	Own	Own	13	1000	.....	2	2.43-3.75	2.43	S. G.	Op.	Yes	75
800	76	K	1 1/2-Strom.	Ben.	Dixie	Twin	Foote	Sl. G.	Modine	Hyatt	Hyatt	Hyatt	14	600	2400	2	2 1/2-3.4	2 1/2	S. G.	In.	Yes	76
1000	77	G-K-D	-Ens.	.....	Dixie	Own	.....	Sl. G.	B. & L.	Own	Own	.....	12 1/2	625	.....	.....	1 1/2-4.1	2 3/4	Ch.	.....	.....	77
575	78	G-K-D	-Own	.....	K-W	Own	.....	Sl. G.	Own	Own	Own	Own	18	575	.....	.....	2 1/2-2 3/4	2 3/4	Ch.	.....	.....	78
575	79	G-K-D	-Own	.....	K-W	Own	.....	Sl. G.	Own	Own	Own	Own	18	575	.....	.....	2 1/2-2 3/4	2 3/4	Ch.	.....	.....	79
1000	80	K	1 1/2-Own	Ben.	K-W	Own	Covert	Sel.	McCord	Timk.	Hyatt	Hyatt	10	1000	2600	3	1 1/2-5	2 1/2	I. G.	In.	No	80
1200	81	G	1 -Carter	Ben.	Dixie	Delt.	Own	Sel.	Eureka	Hyatt	Timk.	Gurney	10	1200	3100	2	2 1/4-4	3	S. G.	In.	Yes	81
700	82	K	-Scheb.	Ben.	Bosch	Own	Own	Sl. G.	Own	.....	.....	.....	11 1/2	700	.....	3	2 1/2-3 1/2	3	S. G.	.....	.....	82
800	83	G-K	1 1/2-Scheb.	.....	K-W	Own	Own	.....	Long	Hyatt	.....	.....	26	320	.....	2	2 1/4-3 1/2	2 1/4	G.	.....	.....	83
800	84	G-K	1 1/2-Scheb.	.....	K-W	Own	.....	Sel.	Long	.....	.....	.....	26	350	.....	2	2 1/4-3	2 1/4	G.	.....	.....	84
0-600	85	G-K	2 -Scheb.	.....	K-W	Own	.....	.....	Long	.....	.....	.....	32	275	.....	1	.....	2 1/2	G.	.....	.....	85
0-500	86	G-K	2 1/2-Scheb.	.....	K-W	Own	.....	.....	Long	.....	.....	.....	34	275	.....	1	.....	2 1/2	G.	.....	.....	86
900	87	K	1 1/2-King.	Ben.	.....	Own	Own	.....	Long	Hyatt	Hyatt	Hyatt	7x11	750	2600	1	2-2 1/2	2 1/2	.....	.....	Yes	87
950	88	K	1 1/2-King.	.....	Dixie	Own	Own	Sl. G.	Perfex	Hyatt	Timk.	Hyatt	18	475	2200	2	1 1/2-2 1/2	2 1/2	G.	In.	.....	88
850	89	G-K	1 1/2-Strom.	Ben.	Dixie	Bier.	Own	.....	S-J	Hyatt	Own	Own	12	900	2825	2	2 1/2-5	2 1/2	S. G.	In.	Yes	89
900	90	G-K	1 1/2-Strom.	Ben.	Berl.	B. & B.	Own	Sl. G.	S-J	N. D.	N. D.	Opt.	14	700	2600	3	1 1/2-8	2 3/4	Worm	.....	Yes	90
1000	91	G-K	1 1/2-Holl.	Ben.	Bosch	B. & B.	Own	Sl. G.	Modine	Hyatt	Own	Hyatt	16	650	2700	2	2.2-2.9	2.9	S. G.	In.	Yes	91
650	92	G-K	1 1/2-Holl.	Ben.	K-W	Own	Own	Sl. G.	Modine	Hyatt	Own	Hyatt	17	528	2350	2	2-2.75	2 3/4	S. G.	In.	.....	92
600	93	G-K	2 -King.	.....	K-W	Own	Own	Sl. G.	Own	Own	Own	Own	20	600	3150	2	1.4-2	2	S. G.	Op.	.....	93
535	94	G-K	2 1/2-King.	.....	K-W	Own	Own	Sl. G.	Own	Own	Own	Own	23	535	200	1	.....	2	G.	Op.	.....	94
535	95	G-K	3 -King.	.....	K-W	Own	Own	Sl. G.	Own	Own	Own	Own	23	535	3200	1	.....	2	S.	Op.	.....	95
.....	96	.....	-King.	.....	Eise.	B. & B.	Spec.	.....	Own	Opt.	Opt.	Opt.	8x12	.....	.....	.....	.....	.....	.....	.....	.....	96
.....	97	G	1 1/2-Holl.	Ben.	Remy	B. & B.	Own	Sl. G.	Modine	Hyatt	.....	Hyatt	9	.....	.....	1	1 1/2-3	3 1/2	G.	In.	.....	97
0-450	98	K	-King.	.....	Dixie	Own	Own	Sl. G.	Perfex	Own	Own	Own	8x22	.....	.....	2	1 1/2-3	1 1/2-3	S. G.	.....	.....	98
0-425	99	K	2 1/2-King.	.....	Wied.	Own	Own	Sl. G.	Perfex	Own	Own	Own	9x24	.....	.....	1	2.1	2.1	S. G.	.....	.....	99
0-375	100	K	3 -King.	.....	Wied.	Own	Own	Sl. G.	Perfex	Own	Own	Own	12x30	.....	.....	1	1.86	1.86	S. G.	.....	.....	100
900	101	G-K	1 1/2-Ben.	Ben.	Dixie	.....	Own	Sl. G.	Modine	Hyatt	.....	Hyatt	21 1/2	2600	450	2	1 1/2-2 1/2	2 1/2	S. G.	.....	.....	101
1000	102	K	1 1/2-King.	Own	Eise.	Own	Own	Sl. G.	Perfex	.....	Hyatt	Hyatt	12	1000	3141	3	1.80-4	.....	I. G.	In.	.....	102
800	103	K	1 1/2-Ben.	Ben.	Eise.	Own	Nutt.	Sl. G.	Eureka	Hyatt	.....	.....	14	650	2500	2	2 1/2-4	2 1/2	I. G.	.....	Yes	103
750	104	G-K	1 1/2-King.	Ben.	K-W	Own	Own	.....	S-J	Timk.	Timk.	Timk.	14	750	.....	3	1 1/2-4	2 1/2	S. G.	.....	.....	104
650	105	G-K	2 -King.	Ben.	K-W	Own	Own	Sl. G.	S-J	Own	Own	Own	17 1/2	650	.....	3	1 1/2-4 1/2	2 1/2	.....	.....	.....	105
1000	106	G-K	1 1/2-Strom.	Len.	Dixie	Twin	Foote	Sl. G.	Perfex	Hyatt	Hyatt	Hyatt	14	590	2200	2	2-3	.....	I. G.	Op.	.....	106
800	107	K	1 1/2-Linga	John.	K-W	Bier.	Own	Sl. G.	S-J	Own	Own	Own	14	800	2500	1	3	3	Ch.	.....	Yes	107
800	108	G-K	-King.	Ben.	Split.	Cwn	Own	.....	Perfex	Opt.	Timk.	Timk.	14	2500	.....	2	3-3	3	G.	.....	Yes	108
900	109	G-K	1 1/2-King.	Own	Eise.	Own	Own	.....	Bremer	S. K. F.	Plain	Plain	14	650-2380	.....	7	1 1/2-4	2	S. G.	In.	Yes	109
.....	110	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1065-3900	.....	.....	.....	.....	.....	.....	.....	.....	110
1000	111	G-K	1 1/4-Ben.	Ben.	Dixie	Bier.	Own	Sl. G.	Modine	Hyatt	.....	Hyatt	14 1/2	2600	703	2 1/2-3 1/2	.....	2 1/2	B. G.	In.	Yes	111
1000	112	G-K	1 -King.	Ben.	Dixie	Own	.....	Fr.	Perfex	U. S.	Own	Own	12	400-2200	.....	7	1-5	1 1/4	B. G.	Op.	Yes	112
.....	113	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1000	.....	.....	.....	.....	.....	.....	.....	.....	113
900	114	G-K	1 1/4-King.	Ben.	Dixie	Own	.....	Fr.	Perfex	U. S.	Own	Own	14	400-2200	.....	7	1-5	2 1/4	B. G.	Cp.	Yes	114
.....	115	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	900	.....	.....	.....	.....	.....	.....	.....	.....	115
1000	116	K	1 1/4-King.	Ben.	Bosch	Own	Cotta	Sl. G.	.....	.....	.....	.....	12 1/2	915	3000	3	1 1/2-3 1/2	2 1/2	S. G.	Op.	.....	116
950	117	K	1 1/4-King.	Ben.	Dixie	Own	Cotta	Sl. G.	.....	.....	.....	.....	12 1/2	810	2850	3	1 1/2-3 1/2	2 1/2	S. G.	Op.	.....	117
825	118	K	1 1/2-King.	Ben.	Dixie	Own	Own	Sl. G.	.....	.....	.....	.....	12 1/2	840	2749	2	2.4-3 1/2	2.4	S. G.	Op.	.....	118
525	119	K	2 -King.	Ben.	Bosch	Own	Own	Sl. G.	.....	.....	.....	.....	24	525	3310	2	2-4 1/2	2	S. G.	Op.	.....	119
.....	120	G	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	120
1200	121	G	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18	375	.....	2	.....	.....	.....	.....	.....	121
1200	122	G	1 -Scheb.	Ben.	Berl.	B. & B.	Own	Sl. G.	Todd	Fafnir	.....	Hyatt	8	2600	.....	2	2-3.1	3.1	.....	In.	Yes	122
1000	123	G	1 -King.	Ben.	Dixie	Full.	Full.	Sl. G.	Modine	.....	Timk.	Timk.	10	850	2200	3	1 1/4-4 1/2	.....	I. G.	In.	.....	123
1100	124	G-K	-King.	Ben.	.....	Foote	.....	Sl. G.	.....	.....	.....	.....	14	600	.....	2	27.4	.....	.....	.....	.....	124
950	125	G-K	1 1/2-Opt.	Opt.	Dixie	.....	Own	Sel.	Splitex	Own	Own	Own	18	950	.....	2	2-3	2 1/2-3	I. G.	.....	Yes	125
.....	126	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	700	.....	.....	.....	.....	.....	.....	.....	.....	126
.....	127	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	490	.....	.....	.....	.....	.....	.....	.....	.....	127
850	128	G-K	1 1/2-Strom.	Ben.	Dixie	.....	Own	.....	Modine	Hyatt	Hyatt	Hyatt	12	850	2669	1	2 1/2	2 1/2	I. G.	.....	Yes	128
.....	129	G-D	1 -King.	Ben.	Berl.	Own	Own	Sl. G.	Modine	Hyatt	Own	Hyatt	12	400	.....	2	2 1/2-3 1/2	2 1/2	G.	In.	No	129
950	130	K	1 1/2-King.	.....	Dixie	Own	Own	Sl. G.	Todd	Hyatt	Hyatt	Own	12	950	2985	1	2 1/2-3	3	S. G.	In.	Yes	130
1000	131	G	1 1/4-Strom.	Ben.	Split.	Twin	Own	Sel.	G. & O.	Gurney	Timk.	Opt.	12	.....	.....	2	2.7-3.7	2.7	G.	In.	No	131
900	132	G	1 1/2-Strom.	Ben.	Eise.	B. & B.	Own	Sel.	Bremer	Hyatt	N. D.	N. D.	12	900	2600	3	1 1/2-4 1/2	2 1/2	I. G.	.....	.....	132
1200	133	G	1 -King.	Donald.	Eise.	Own	Own	Sl. G.	S. J.	.....	Own	Hyatt	8	1200	2600	2	1-3 1/2	2 1/2	G.	In.	No	133
1000	134	G	-King.	Own	Dixie	B. & B.	Own	Sl. G.	G. & O.	Own	Own	.....	8	1200	1000	1	3 1/2-5	3 1/2	B. G.	.....	.....	134
1000	135	G-K	1 1/4-King.	Ben.	Dixie	Own	Own	.....	Perfex	Hyatt	Own	Own	14	600	600	2-2 1/2	1 1/2-3	2 1/2	.....	.....	Yes	135
900	136	K	1 1/2-Ben.	Ben.	Dixie	Twin	Nutt.	Sl. G.	Perfex	Timk.	Timk.	Timk.	11	900	2600	2.6-3.8	2-4	2.6	S. G.	In.	Yes	136
1000	137	G	1 -Car.	Ben.	Berl.	B. & B.	Own	Sl. G.	James.	Schats	Hyatt	Opt.	10	820	2650	2	1 1/2-4 1/2	2 1/2	S. G.	.....	.....	137
900	138	G	1 1/4-Ben.	Ben.	Berl.	B. & B.	Own	Sl. G.	James.	Schats	Hyatt	Opt.	10	800	2600	2	1 1/2-4	2 1/2	S. G.	.....	.....	138
1050	139	G-K	-Ben.	Ben.	Simms	B. & B.	Own	Sl. G.	B. & W.	Gurney	Gurney	Hyatt	10	1000	2300	2	2 1/2-3 1/2	2 1/2	I. G.	In.	Yes	139
750	140	K	1 1/2-Scheb.	.....	Dixie	Own	Own	Sl. G.	Modine	Hyatt	.....	Hyatt	14	750	2750	2 1/2-3	2 1/2-3	2 1/2-3	I. G.	Opt.	Yes	140
960	141	G	.....	.....	Dixie	Full.	Fuller	S. G.	Ideal	.....	.....	.....	12	900	.....	3	2-5	3 1/2	I. G.	In.	Yes	141
800	142	K	1 1/2-Strom.	Ben.	Eise.	B. & B.	Foote	S. G.	Perfex	Hyatt	.....	.....	16	600	2600	2	1 1/2-4	2 1/2	S. G.	In.	.....	142
700	143	D	1 1/4-Ens.	Donald.	Bosch	B. & B.	Own	S. G.	Own	Hyatt	.....	Hyatt	12	700	2200	3	1.5-4	2.08	B. P.	.....	.....	143
700	144	D	-Strom.	Donald.	Bosch	Para.	Own	S. G.	Own	Hyatt	.....	Hyatt	10-14	700	1835	2	2.06-3.28	2.06	I. G.	.....	.....	144

## One and Two-Horse Tractors

Line No.	Fuel	Make and size of carburetor	Make of air cleaner	Make of magnet	Make of clutch
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# Motor Age Monthly Guide to Tractors

Line Number	Manufacturer	Tractor and Model	Drawbar horsepower	Boiler horsepower	Number plows recommended	Size separator recommended	Pounds pull drawbar	Weight	Price	Traction	Diameter drive wheels	Make of engine	No. and type of cylinder	Bore and stroke	Normal R. I. M.
151	Elderfield Mechanics Co., Pt. Washington, N. Y.	Universal, 20	1	4	1		250	750	450		36	Own	1 Ver.	3½ x 5	1000
152	Indiana Silo Co., Anderson, Ind.	Indiana	5	10	1		900	2000		Wh.	50	Le Roi	4 Ver.	3½ x 4½	950
153	La Crosse, Trac. Co., La Crosse, Wis.	La Crosse, M.	7	12	1-16	18	1000	2600	750	Wh.	48	Own	2 Hor.	4 x 6	1000
154	Market Garden Trac. Co., Minneapolis, Minn.	Market	2	4½	1-7			550			24	Veer	1 Hor.	4 x 4	850
155	Midwest Engine Co., Indianapolis, Ind.	Utilitor	1½	3½	1		150-200	750	380	Wh.	24½	Own	1 Ver.	3½ x 4½	1200
156	New Britain Mch. Co., New Britain, Conn.	New Britain, 1	3	6	1-8		400	650	450	Wh.	26½	Own	2 Ver.	2½ x 4	1500
157	New Britain Mch. Co., New Britain, Conn.	New Britain, 2	3	6	1-8		400	750	500	Wh.	32	Own	2 Ver.	2½ x 4	1500
158	Oldsmar Tractor Co., Oldsmar, Fla.	Oldsmar	1-3	5	1		150-450	1200	375	Wh.	32	Evin.	1 Ver.	5 x 5½	580
159	Scientific Farming Mch., Minneapolis, Minn.	Princess Pat	12	25	2	24 x 26	2000	3500	1,750	Wh.	46	Buda	4 Ver.	4¼ x 5½	1000
160	Tillermobile Co., Minneapolis, Minn.	Tillermobile, A	2	6	1-8			625	385	Wh.	30	Veer	1 Ver.	4 x 4	1200
161	Toro Motor Co., Minneapolis, Minn.	Toro		12	1		1100	2400	900	Wh.	42	Le Roi	4 Ver.	3½ x 4½	1200

## Motor Cultivators

162	Avery Co., Peoria, Ill.	Avery, C						3450		Wh.	38	Own	4 Ver.	3 x 4	1200
163		Avery, 5-10	5	10				3050		Wh.	38	Own	4 Ver.	3 x 4	1200
164	Bailor Plow Mfg. Co., Atchison, Kans.	Bailor, A	6					2150	925	Wh.	44	Le Roi	4 Ver.	3½ x 4½	1000
165		Bailor, W	6					1800	775	Wh.	40	Le Roi	4 Ver.	3½ x 4½	1000
166	Detroit Culto-Tractor Corp., Detroit, Mich.	Detroit Culto, AA	9	16	2	20 x 28	1600	1800	775	Wh.	42	Own	2 Ver.	4 x 6	408
167	Emerson-Brantingham Co., Rockford, Ill.	E-B			None			3200		Wh.	42	Le Roi	4 Ver.	3½ x 4½	100
168	Parrett Motor Corp., Chicago	rr ett, J	6	12	2	none		3000	890	Wh.	44	Le Roi	4 Ver.	3½ x 4½	1000
169	Rock Island Plow Co., Rock Island, Ill.	Heider, 10	6	10	1			2700		Wh.	46	Le Roi	4 Ver.	3½ x 4½	
170	Shaw Enochs Trac. Co., Minneapolis, Minn.	Shawnee	6	12	1		1100	2600		Wh.	60	Le Roi	4 Ver.	3½ x 4½	1200
171		Shawnee	9	18	2	22	2100	3800		Wh.	60	Gray	4 Ver.	3½ x 5	1200
172	Toro Motor Co., Minneapolis, Minn.	Toro					1100	2800		Wh.	42	Le Roi	4 Ver.	3½ x 4½	1200

Abbreviations: **Traction**—Wh., wheel; Cr., crawler. **Engine**—Beav., Beaver; Veer., Veerac; Herc., Hercules; Wauk., Waukesha; Buff., Buffalo; Asso., Associated Manufacturers; Auto., Automatic; Weid., Weidely; Clim., Climax; Twin, Twin City; Cont., Continental; Ruten, Rutenber; Over., Overland; Kenn., Kenneth. **Cylinders**—Ver., Vertical; Hor., horizontal; Opp., opposed. **Fuel**—G., gasoline; K., kerosene; D., distillate. **Carburetor**—Ray., Rayfield; King, Kingston; Holl., Holley; Scheb., Schebler; Ben., Bennett; Web., Webster; Zeph., Zephyr; Ens., Ensign; Strom., Stromberg; Till., Tillotson; Zen., Zenith; Car., Carter. **Air-Cleaner**—Donal., Donaldson; Ben., Bennett; Hol., Holley. **Magneto**—A-K., Atwater-Kent; Sum., Sumter; Eise., Eisemann; Berl., Berling. **Clutch**—B. & B., Borg & Beck; Bier., Bierman; Mun., Muncie; Rock., Rockwood; spec., special. **Gearset**—B. & S., Brown & Sharpe; Nutt., Nuttall. **Gearset type**—Sl. G., sliding gear; Sel. G., selective gear; Fr., friction; Plan., planetary; Sl. J. C., sliding jaw clutch. **Final Drive**—S. G., spur gear; Ch., chain; D. R., double reduction; B. G., bull gear. **Drive**—Op., open; In., inclosed.

## THE JUMBO HIGHWAY EXPRESS

Special Construction and Features Enable Users to Secure a Maximum of 25 m.p.h. with a 4000 Lb. Load

THE Nelson Motor Truck Co. is offering a new model called the Jumbo Highway Express, a most complete truck, which permits of highway speed

with a maximum of 4000 lb. capacity. Many of the exclusive features found on other Jumbo models are incorporated in this new two-ton job, and in addition,



the truck is completely equipped, ready for use and with every possible comfort for the driver.

One of the particular features is the mounting of the engine at an angle of two deg. 20 min., permitting a straight line drive under load. This mounting of the engine has been worked out with the sanction of the engineers of the Buda Engine Co., and represents efficiency in the drive, due to the elimination of angularities at the universal joints.

The final drive is the Clark internal gear axle.

Another feature is in connection with the springs. At the front end of the

### SPECIFICATIONS

Capacity—4000 lb with pneumatic tires.

Engine—Buda.

Rear Axle—Clark Internal Gear.

Magneto—Eisemann.

Radiator—Equipped specially with shutters for temperature regulation.

Also equipped with radiator guard. Electric lights—Rear light set in flush with frame to prevent lamp breakage.

rear spring, the first leaf forms the driving eye, and the second leaf is wrapped around the eye bolt to provide against spring breakage.

This model is equipped with radiator shutters which are controlled from the driver's seat, giving temperature regulation. A motometer is also a part of the radiator equipment. The fan is designed



# and Their Technical Specifications

A. F. M.

 1000  
950  
1000  
850  
1200  
1500  
1500  
580  
1000  
1200  
1200

Line No.	Fuel	Make and size of carburetor	Make of air cleaner	Make of magneto	Make of clutch	Make of gearset	Type of gearset	Make of radiator	Make of bearings in transmission	Make of bearings in front axle	Make of bearings in rear axle	Belt pulley diameter	Belt pulley R. P. M.	Belt Speed F. P. M.	Speeds forward	Speed range M. P. H.	Recommended plowing speed	Final Drive	Drive	Furrow wheel	Line No.
151	G	3/4-Zen.	Ben.	A-K	Own	Own	Sl. G.	Main	Own	Own	Own	6	1000	2600	1	1-3	2	Worm	Op.	Yes	151
152	K	3/4-King.	Ben.	A-K	Own	Own	Sl. G.	Cand.	Own	Own	Own	6	1200	2600	1 1/4-4	1 1/4-2 1/2	2 1/2	Ch.	Op.	Yes	152
153	K	1 1/4-King.	Ben.	Own	Own	Own	Own	Hopper	Own	Own	Own	10	1000	2600	1	1 1/4-2 1/2	2 1/2	Worm	Op.	Yes	153
154	G	1 -Scheb.	Ben.	Berl.	Own	Own	Spec.	Hess-B.	Timk.	Own	Own	6	2000	2600	1	1 1/4-2 1/2	2 1/2	Worm	Op.	Yes	154
155	G	3/4-King.	Own	Eise.	Own	Own	Modine	Own	Own	Own	Own	4 1/2	1200	1200	1	1-4	2 1/2	I. G.	In.	Yes	155
156	G	3/4-King.	Ben.	Dixie	Own	Own	G. & O.	Own	Own	Own	Own	5 1/2	1500	2160	1	1-3	2 1/2	B. G.	In.	Yes	156
157	G	3/4-King.	Ben.	Dixie	Own	Own	G. & O.	Own	Own	Own	Own	5 1/2	1500	2160	1	1-3	2 1/2	B. G.	In.	Yes	157
158	G	1 -Scheb.	Own	Opt.	Own	Own	None	Own	Own	Own	Own	5	580	240	2 1/2	2 1/2-4 1/2	2 1/2	I. G.	In.	Yes	158
159	K	1 1/4-Ben.	Martain	Dixie	B. & B.	Own	Sl. G.	S-J	Hyatt	Hyatt	Hyatt	12	1000	3100	2	2 1/2-4 1/2	2 1/2	I. G.	In.	Yes	159
160	G-K	-Verac	Own	Berl.	Own	Own	D. R.	Own	Own	Own	Own	11	1000	3100	1	1-3	2 1/2	B. G.	In.	Yes	160
161	G	3/4-King.	Ben.	Eise.	Own	Own	Sl. G.	B. & W.	Opt.	Own	Own	8	1200	2400	2	1-3 1/2	3 1/2	B. G.	In.	Yes	161

## Motor Cultivators

 1200  
1200  
1000  
1000  
400  
100  
1000  
1200  
1200  
1200  
1200

162	G-K	3/4-King.	Ben.	K-W	Own	Own	Sl. G.	Own	Hyatt	Own	Own	12	780	2450	3	1 1/4-4 1/2	2 1/2	S. G.	Op.	Yes	162
163	G-K	3/4-King.	Ben.	K-W	Own	Own	Sl. G.	Own	Hyatt	Own	Own	12	780	2450	3	1 1/4-4 1/2	2 1/2	S. G.	Op.	Yes	163
164	G	3/4-King.	Ben.	Dixie	B. & B.	Own	Perfex	Hyatt	Hyatt	Hyatt	Hyatt	8	885	1800	2	2 1/2-3.7	2 1/2	Ch.	Op.	Yes	164
165	G	3/4-King.	Ben.	Dixie	B. & B.	Own	Perfex	Hyatt	Hyatt	Hyatt	Hyatt	8	885	1800	2	2 1/2-3.7	2 1/2	Ch.	Op.	Yes	165
166	G	1 1/4-Strom.	Own	Bosch	Own	Own	Sl. G.	Own	Hyatt	Own	Own	8	885	1800	2	1-3	2 1/2	B. G.	In.	Yes	166
167	G	-Holl.	Ben.	Dixie	Own	None	None	Perfex	Hyatt	Own	Hyatt	7 1/2	995	1800	1-5	1 1/2-3 1/2	None	B. G.	In.	Yes	167
168	G	3/4-King.	Own	Eise.	B. & B.	Own	Sel.	Modine	S.K.F.	Hyatt	Hyatt	6	1000	1800	2	1.3-3.5	3.1	I. G.	Op.	Yes	168
169	G	3/4-King.	Ben.	Dixie	Own	Own	Perfex	Opt.	Hyatt	Own	Hyatt	8	1000	1800	2	1 1/2-3 1/2	3.1	B. G.	Op.	Yes	169
170	G	1-Scheb.	Ben.	Berl.	B. & B.	Own	Todd	Fafnir	Hyatt	Own	Hyatt	8	1000	1800	2	2-3.1	3.1	In.	Yes	Yes	170
171	G	1-Scheb.	Ben.	Berl.	B. & B.	Own	Todd	Fafnir	Hyatt	Own	Hyatt	8	1000	1800	2	2-3.1	3.1	In.	Yes	Yes	171
172	G	3/4-King.	Ben.	E. & D.	Own	Own	Sl. G.	B. & W.	Opt.	Own	Own	8x6	1200	2400	2	1-3 1/2	3 1/2	B. G.	In.	Yes	172

Abbreviations: Traction—Wh., wheel; Cr., crawler. Engines—Beav., Beaver; Veer., Veerac; Herc., Hercules; Wauk., Waukesha; Buff., Buffalo; Asso., Associated Manufacturers; Auto., Automatic; Weid., Weidely; Clim., Climax; Twin, Twin City; Cont., Continental; Ruten, Rutenber; Over., Overland; Kenn., Kenneth. Cylinders—Ver., Vertical; Hor., horizontal; Opp., opposed. Fuel—G., gasoline; K., kerosene; D., distillate. Carburetor—Ray., Rayfield; King, Kingston; Holl., Holley; Scheb., Schebler; Ben., Bennett; Web., Webster; Zeph., Zephyr; Ens., Ensign; Strom., Stromberg; Till., Tillotson; Zen., Zenith; Car., Carter. Air-Cleaner—Donal., Donaldson; Ben., Bennett; Hol., Holley. Magneto—A-K., Atwater-Kent; Sum., Sumter; Eise., Eiseman; Berl., Berling. Clutch—B. & B., Borg & Beck; Bier., Bierman; Mun., Muncie; Rock., Rockwood; spec., special. Gearset—B. & S., Brown & Sharpe; Nutt., Nuttall. Gearset type—Sl. G., sliding gear; Sel. G., selective gear; Fr., friction; Plan., planetary; Sl. J. C., sliding jaw clutch. Final Drive—S. G., spur gear; Ch., chain; D. R., double reduction; B. G., bull gear. Drive—Op., open; In., inclosed.

with a shroud permitting air to be drawn uniformly through the whole surface of the radiator, utilizing all of the radiator space. Radiator filler cap is securely attached preventing any loss of same and making it unnecessary to remove when filling radiator. The radiator drain cock and overflow pipe cannot become clogged, due to straight line design from filler cap to bottom of radiator.

Throughout, the truck is completely equipped with Alemite lubricating system. Standard equipment also consists of power take-off, tire pump, also power take-off for operating light winches, etc. Main feature on this model is the 4 to 1 low gear ratio. This company produces a number of other models ranging from 3000 to 8000 lb. capacity.

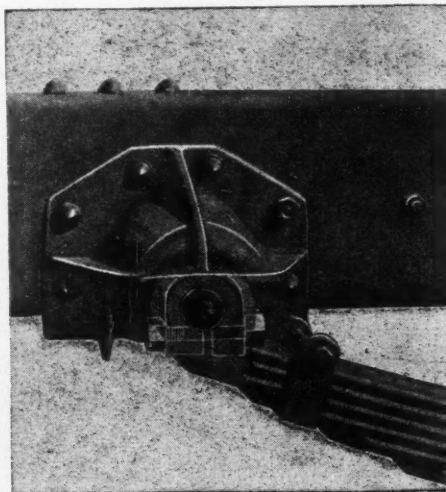
## NEW WESTINGHOUSE AUTOMOTIVE EQUIPMENT

A new line of automotive starting motors and lighting generators has been developed by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. This line is in addition to the present line of machines furnished by the company.

The chief feature of these new motors and generators, which are known as type PW, is the construction of the frame and the commutator end-bracket. In the older type, the frame was short and the bracket cylindrical. In the new type the frame is extended and the bracket is flat; and the brushes, which are mounted on the bracket, are housed within the extension of the frame. Openings in the frame, covered ordinarily by

an easily removed steel band, give access to the commutator and brushes.

This construction provides additional mechanical strength to the machine. The brushes and commutator are especially accessible, and the brushes can



Showing spring suspension of the new Jumbo truck

be renewed without taking off the bracket.

The generators, which are of the third-brush type, have an additional advantage in that the position of the third brush can be adjusted from the outside without removing the bracket. This is accomplished by mounting the brush on an arm which is pivoted around the bearing

housing and is firmly held by screws on the outside of the end bracket. When these screws are loosened, the arm and the brush can be turned through any desired angle.

These motors can be supplied for cradle, flange, or sleeve mounting and with either inboard or outboard screw pinion shifts. The generators can be supplied for cradle, flange, or foot mounting, with either ball or sleeve bearings, and with or without ignition rackets.

## "SHIP-BY-TRUCK" WEEK CELEBRATED

(Concluded from page 24)

The caravan will start on Meridian street, just north of Thirty-eighth street, at 7:30 Monday morning. Mayor Jewett will act officially as starter for the "advance agents of progress" on their week's tour. The dealers participating in the tour are as follows: Cartenhour-Bowman Company, General Motor Truck Company, Indiana Motor Company, Master Motor Company, the Lathrop-McFarland Company, Losey-Nash Motor Company, the Wildhack Company, Fisher Automobile Company and Martin Truck Company.

The caravan will be accompanied by a division of the Indianapolis Military band. The National Refining Company will send a truck to give gasoline and oil service to the trucks during the week. A novel feature of the tour will be a Delco farm lighting system, which will be used to illuminate the caravan at night at the stops where band concerts and speaking will be held.

# From the Four Winds

## Glimpses at the World of Motordom

### COMING MOTOR EVENTS

AUTOMOBILE SHOWS		
Indianapolis	Fall Automobile Show	Sept. 6-11
Northampton, Mass.	Annual Automobile Show	Oct. 6-8
FOREIGN SHOWS		
Antwerp	Cars, Tires, Wheels, Parts and Equipment	May 15-June 13
Antwerp	Commercial Vehicles, Tractors, Trucks and Engines	June 26-July 25
London	Commercial Vehicles, Exhibition, Olympia	October
London	Passenger Car Show, Olympia	November
CONVENTIONS		
Charleston, S. C.	South Carolina Automotive Trade Ass'n	June 24-25
RACES		
Uniontown, Pa.	Speedway Race	June 12
Portland, Ore.	Dirt Track	June 17
Chicago, Ill.	Inter Club Run	June 17-18
Ogdensburg, N. Y.	Dirt Track	June 19
Hanford, Cal.	Dirt Track	July 4
Spokane, Wash.	Dirt Track	July 4
Tacoma, Wash.	Speedway Race	July 5
Batavia, N. Y.	Dirt Track	July 5
Warren, Pa.	Dirt Track	July 17
Watertown, N. Y.	Dirt Track	July 24
Fulton, N. Y.	Dirt Track	July 31
Paris, France	Grand Prix Race, Sporting Commission	August
Eric, Pa.	Dirt Track	Aug. 7
Buffalo, N. Y.	Dirt Track	Aug. 14
Johnstown City, Pa.	Dirt Track	Aug. 21
Elgin, Ill.	Road Race	Aug. 21
Middletown, N. Y.	Dirt Track	Aug. 20-21
Flemington, N. J.	Dirt Track	Aug. 27-28
Canandaigua, N. Y.	Dirt Track	Aug. 28
Cincinnati, O.	Speedway Race	Sept. 6
Hornell, N. Y.	Dirt Track	Sept. 6
Uniontown, Pa.	Speedway Race	Sept. 6
Syracuse, N. Y.	Dirt Track	Sept. 17-18
Allentown, Pa.	Dirt Track	Sept. 25
TOURS		
Omaha, Neb.	Truck Reliability Run	June 14
Milwaukee, Wis.	Wisconsin Truck Tour, Milwaukee Sentinel	June 21-26
Lake Huron Tour	Michigan Pikes Ass'n	July 4
New York-San Francisco	Glidden Tour	September

**Canada Adds to Automobile Tax**—The imposition of an additional excise tax on automobiles did not surprise many of the local automobile dealers. It was the consensus of opinion in the local trade that some attention would be paid to the motor car in arranging for increased revenue for the Government. Two or three of the local dealers predicted that the new tax would amount to 15 per cent. The trade was rather divided on the question as to whether the Government would impose an additional impost on commercial vehicles or not, and it was generally believed that no tax would be placed upon used car sales because of the generous taxation upon all automobiles when new.

The interesting fact is forthcoming that one Ottawa man cancelled arrangements for the opening of a new automobile salesroom in the capital after he had heard that an additional tax would be imposed upon passenger cars. He had arranged to represent several new lines here, it is declared, and had taken an option on available premises in the downtown section. He permitted this option to lapse last Saturday, it is stated, and took up another business proposition entirely.

**Accidents Usually Victims' Fault**—Actual speeding was responsible for only

three out of the forty-one deaths in Toronto, due to motor car accidents, during the year 1919, according to figures given out by the police authorities to-day.

The classification of the forty-one fatalities, according to the causes, is given as follows:

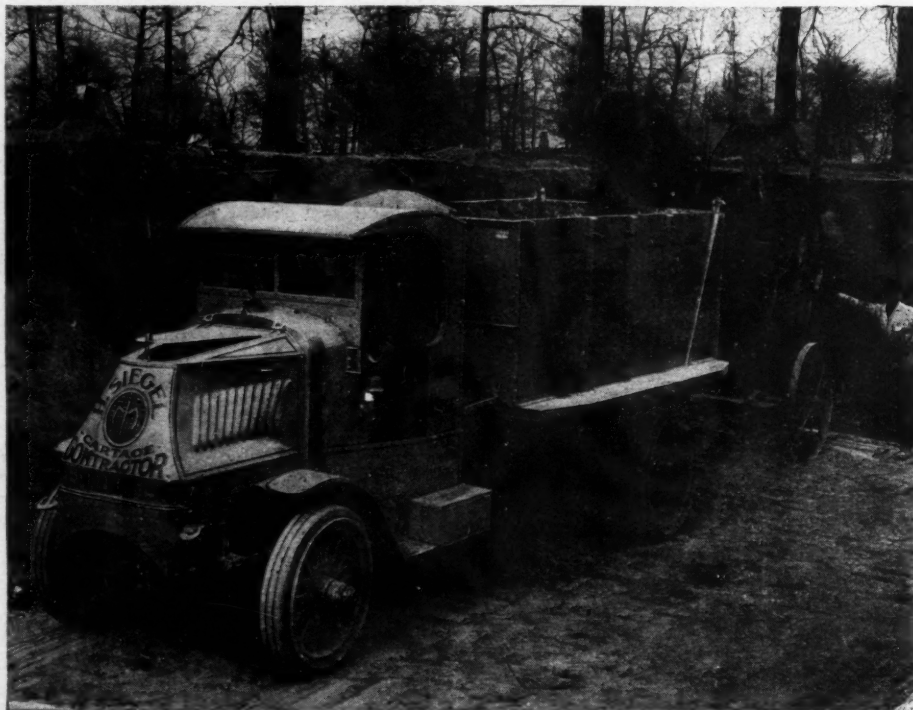
By exceeding speed limit	3
By motor trucks, which are limited to speed of 8 or 10 miles an hour, according to weight of car	2
By reckless or careless handling of cars	6
By negligence of the persons killed	30
By drunken drivers	0

Total.....41

The police say that more than half of the victims were children, and that the great majority of accidents is due to children running heedlessly out on the streets.

It is remarkable that not one death was due to drunken driving, though quite a number of people were injured by cars driven by intoxicated persons.

The figures indicate the need of motorists to guard against the carelessness of pedestrians on crowded streets and dangerous intersections, as well as for pedestrians to look before they step off the sidewalk.



**AUTOMATIC LOADER LOADS TEN-TON TRUCK IN TEN MINUTES**

The Chicago Automatic Conveyor Co. is manufacturing an automatic conveyor for loading sand, coal and different material, thereby saving time and money.

The photograph shows a Mack truck being loaded with sand